
**Information technology — Portable
Common Tool Environment (PCTE) —**

Part 3:

Ada programming language binding

*Technologies de l'information — Environnement d'outil courant
portable (PCTE) —*

Partie 3: Liant de langage de programmation Ada

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 13719-3 was prepared by ECMA (as Standard ECMA-162) and was adopted, under a special “fast-track procedure”, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

This second edition cancels and replaces the first edition (ISO/IEC 13719-3:1995), which has been technically revised.

ISO/IEC 13719 consists of the following parts, under the general title *Information technology - Portable Common Tool Environment (PCTE)*:

- Part 1: Abstract specification
- Part 2: C programming language binding
- Part 3: Ada programming language binding
- Part 4: IDL binding (*Interface Definition Language*)

Annex A forms an integral part of this part of ISO/IEC 13719.

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Information technology — Portable Common Tool Environment (PCTE) —

Part 3:

Ada programming language binding

1 Scope

This part of ISO/IEC 13719 defines the binding of the Portable Common Tool Environment (PCTE) interfaces, as specified in ISO/IEC 13719-1, to the Ada programming language.

A number of features are not completely defined in ISO/IEC 13719-1, some freedom being allowed to the implementor. Some of these features are specified as implementation limits. Some constraints are placed on these implementation limits by this part of ISO/IEC 13719. These constraints are specified in clause 24.

PCTE is an interface to a set of facilities that forms the basis for constructing environments supporting systems engineering projects. These facilities are designed particularly to provide an infrastructure for programs which may be part of such environments. Such programs, which are used as aids to system development, are often referred to as tools.

2 Conformance

An implementation of PCTE conforms to this part of ISO/IEC 13719 if it conforms to 2.2 of ISO/IEC 13719-1, where the binding referred to there is taken to be the Ada language binding defined in clauses 1 to 5 and 8 to 25 of this part of ISO/IEC 13719. All other parts of this part of ISO/IEC 13719 are provided as assistance to the reader and are not normative.

The Ada language binding defined in this part of ISO/IEC 13719 conforms to 2.1 of ISO/IEC 13719-1.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 13719. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 13719 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/IEC 13719-1:1998,	<i>Information technology - Portable Common Tool Environment (PCTE) - Part 1: Abstract specification.</i>
ISO/IEC 13719-2:1998,	<i>Information technology - Portable Common Tool Environment (PCTE) - Part 2: C programming language binding.</i>
ISO 8601:1988,	<i>Data elements and interchange formats - Information interchange - Representation of dates and times.</i>
ISO/IEC 8652:1995,	<i>Information technology - Programming languages - Ada.</i>

ISO/IEC TR 10182:1993, *Information technology - Programming languages, their environments and system software interfaces - Guidelines for language bindings.*

ISO/IEC 11404:1996, *Information technology - Programming languages, their environments and system software interfaces - Language-independent datatypes.*

4 Definitions

All technical terms used in this part of ISO/IEC 13719, other than a few in widespread use, are defined in the body of this part of ISO/IEC 13719 or in the referenced documents.

5 Formal notations

All datatypes and subprogram definitions are expressed using ISO/IEC 8652 conformant syntax.

6 Outline of the Standard

Clause 7 describes the strategy used to develop this binding specification.

Clause 8 defines the mapping from the datatypes that are used in the abstract specification to Ada programming language datatypes.

Clauses 9 to 22 define the bindings of datatypes and operations in the corresponding clauses of ISO/IEC 13719-1. The extensions for fine-grain objects are added at the end of clause 11.

Clause 23 defines the binding of object and type references, as specified in ISO/IEC 13719-1 23.1.2 and 23.2. Because of the package structure, this clause consists of a cross-reference to the definitions which are in 8.4.

Clause 24 defines the binding of the implementation limit subprograms described in ISO/IEC 13719-1, clause 24.

Clause 25 defines the binding of the error conditions specified in ISO/IEC 13719-1, clause 25, and defines binding-defined error conditions for the Ada binding.

Annex A, which is normative, contains the extensions for object orientation, corresponding to annex G of ISO/IEC 13719-1.

7 Binding strategy

7.1 Ada programming language standard

The Ada package specifications were designed to conform to ISO/IEC 8652.

7.2 General principles

The following general principles were applied when generating the binding in this part of ISO/IEC 13719.

ISO/IEC TR 10182 should be followed as far as possible for binding method 1: provide a completely defined procedural interface.

Each operation in ISO/IEC 13719-1 should be represented by one subprogram in this part of ISO/IEC 13719 unless there are specific reasons to the contrary.

All Ada identifiers should be in lower case except for predefined identifiers, named constant values, and enumeration literals. Since the Ada standard is insensitive to case this is for typographical consistency between ISO/IEC 13719-1, ISO/IEC 13719-2, and this part of ISO/IEC 13719.

Nondefining occurrences of the names of Ada subprograms and types should use the fully qualified form, so as to identify all package dependences.

All the Ada packages should have names that begin with 'Pcte_' to ensure they are unique within an Ada Library System. The choice of case of the characters of 'Pcte' is for typographical consistency with ISO/IEC 13719-2.

An abstract operation with name of the form 'TYPE_VERB_PHRASE' should be mapped to an Ada subprogram 'verb_phrase' declared by a package called 'Pcte_type'. For example, 'PROCESS_SET_WORKING_SCHEMA' is mapped to 'Pcte_process.set_working_schema'

When a package hierarchy is required, it should be compatible with the abstract specification clause organisation. For example, 'ACCOUNTING_LOG_READ' is mapped to 'Pcte_accounting.log.read'.

Names should be retained from ISO/IEC 13719-1 as far as possible.

All additional names should be chosen appropriately for their meanings.

Each operation that can return errors should have an additional **in** parameter of an access type designating an object into which error indications can be returned. This allows the subprograms to be procedures or functions as appropriate.

Wherever practical, types introduced for passing complex data entities between a caller and a subprogram should be private or limited private. Limited private types should be used unless the basic operations on entities of such types are safe and consistent with ISO/IEC 13719-1.

All simple parameter types in ISO/IEC 13719-1 that represent attribute value types should be mapped to corresponding Ada types defined by this binding.

All simple parameter types in ISO/IEC 13719-1 that do not represent attribute value types should be mapped to predefined types or subtypes or derived types of predefined types.

7.3 Dynamic memory management

A type defined in this part of ISO/IEC 13719 for which an object is created dynamically is always limited private, and subprograms are provided to construct, access and discard such objects.

It is the responsibility of the Ada program that declares a variable of such an Ada type to ensure that its 'construct' subprogram is called before the variable is read; the construct subprogram always initializes the value of the variable. Use of a variable of this type before calling its construct subprogram, or after calling its discard subprogram always causes an error to be generated.

It is the responsibility of the Ada program that defines variables of such Ada types to ensure that the 'discard' subprogram is called when the variable is no longer needed and before the immediate scope of the variable is left. If such a variable goes out of scope without being discarded there is the possibility that the memory allocated to it cannot be recovered, which may result in the exception `STORAGE_ERROR` being raised subsequently.

If a constructed variable is constructed again without having been discarded, no error is reported; such usages of the interface are regarded as akin to allowing such variables to go out of scope before they are discarded.

7.4 Complex entities as parameters

Some complex entities to be passed into or retrieved from an operation are defined as sets or sequences of a base type in ISO/IEC 13719-1. Where such sets and sequences are bounded and constrainable by the user they are mapped to Ada language array types.

Where such sets and sequences are unbounded they are mapped to limited private types declared by nested packages. These limited private types are defined with operations for construction with initial value, access and discarding. A value is assigned to an object of one of these types either as a parameter of mode **out** or **in out** of a subprogram corresponding to an abstract operation of ISO/IEC 13719-1, or by use of a subprogram of the appropriate nested package.

Thus the data values contained in sequences can be easily manipulated using Ada language facilities, while allowing the implementation to choose the best implementation.

All the operations that have a sequence as an **in out** parameter create the elements of the sequence and return it as a result of the operation. The user does not need to create the elements of the sequence in advance: the user needs only to declare a sequence variable and pass that variable.

7.5 Character strings

Values of datatype `String` are manipulated as the Ada type `Pcte.string` which is a subtype of the predefined type `STANDARD.STRING`.

7.6 Error conditions

This part of ISO/IEC 13719 allows any error to be recorded as an error value or to be raised as an exception. This is achieved by providing a limited private type, `Pcte_error.handle`, into objects of which type error values, established by a subprogram defined in this part of ISO/IEC 13719, can be recorded. These handles may also be set to cause any error to be raised as an exception instead of recording it as an error value.

7.7 Implementation limits

ISO/IEC 13719-1 defines a set of limits that must be honoured by all implementations of a Language Binding. Clause 24 defines the Ada names for these limits and the operations by which they can be retrieved.

8 Datatype mapping

This clause defines the mapping of the parameter and result datatypes of the operations of ISO/IEC 13719-1 (*PCTE datatypes*) to the parameter and result datatypes of the operations of this part of ISO/IEC 13719 (*Ada datatypes*).

PCTE datatype names are printed in normal characters, the names of parameters to operations of ISO/IEC 13719-1 are printed in italics and the names of the operations themselves are printed in all upper case characters. PCTE datatype constructors are printed in bold. LI datatype names are printed in italics. Ada datatype names are printed in normal characters, as are the names of Ada subprograms and their parameter names. Enumeration literals, exception names and the names of constant objects are printed in all upper case characters. Ada reserved words are printed in bold.

The mapping from PCTE datatypes to Ada datatypes is done in two stages, via *LI datatypes* defined in ISO/IEC DIS 11404.

8.1 Mapping of PCTE datatypes to LI datatypes

As far as possible the names of PCTE datatypes are retained, with minor typographical changes, for the corresponding LI datatypes, but some new names are introduced.

The general strategy of this mapping is as follows:

- To select for each PCTE datatype a LI datatype definition which matches the requirements of the PCTE datatype defined in ISO/IEC 13719-1. The LI datatype definition is, where possible, a primitive LI datatype, and otherwise a generated LI datatype.
- To define new datatype generators where needed.
- To map PCTE datatypes with the same properties to the same LI datatype.

8.1.1 Mapping of predefined PCTE datatypes

The mapping of these PCTE datatypes is as defined in ISO/IEC 13719-1, clause 23 and is summarized in table 1.

Table 1 - Mapping of attribute value types

PCTE datatype	LI datatype
Boolean	<i>boolean</i>
Integer	<i>pcte-integer = integer range (lb1 .. ub1)</i>
Natural	<i>pcte-natural = integer range (0 .. ub1)</i>
Float	<i>pcte-float = real (10, f1) range (lb2 .. ub2)</i>
Time	<i>pcte-time = time (second, 10, f2) range (lb3 .. ub3)</i>
Octet	<i>octet</i>
Text	<i>pcte-text = characterstring (repertoire)</i>
Enumerated type xxx=VALUE1 VALUE2 ...	<i>pcte-xx = enumerated (value1, value2, ...)</i>

8.1.2 Mapping of private PCTE datatypes

Table 2 - Mapping of other primitive PCTE datatypes

PCTE datatype	LI datatype
Address	<i>see below</i>
Contents_handle	<i>contents-handle = private</i>
Handler	<i>not used</i>
Message_handle	<i>not used</i>
Message_type	<i>see below</i>
Object_reference	<i>object-reference = private</i>
Link_reference	<i>link-reference = private</i>
Type_reference	<i>type-reference = private</i>
Position_handle	<i>position-handle = private</i>
Profile_handle	<i>profile-handle = private</i>

The PCTE datatype Address is mapped directly to a subtype of the predefined Ada type SYSTEM.ADDRESS.

The PCTE datatype Message_type is mapped directly to an Ada record type Pcte_message.message_type.

8.1.3 Mapping of complex PCTE datatypes

PCTE sequence datatypes are mapped via the new datatype generator *pcte-sequence* (see 8.1.4).

PCTE set datatypes are divided into bounded set types and unbounded set types. Bounded set types have values which are sets of enumeration values with at most 32 possible elements; all others are unbounded set types. Bounded set types are mapped via the new LI datatype generator *Bounded-set*. Unbounded set types are mapped via the new LI datatype generator *pcte-sequence*; the order of elements in the sequence is ignored by the operation. For *Message_types* see 14.1.

When used as input parameter of an operation in clauses 9 to 22, a sequence which represents a PCTE unbounded set may contain repeated elements. The effect for the operation is as though each element occurred only once.

When returned as the result of an operation in clauses 9 to 22, an unbounded set has no repeated elements. The order of the elements in the sequence is arbitrary except for the procedure *normalize*, see 8.4.

PCTE map datatypes are notionally mapped via a new LI datatype generator *Map*; their mappings to Ada datatypes are defined directly (see 19.1).

PCTE union datatypes other than enumerations are notionally mapped via the datatype generator *Choice*. The only such PCTE datatypes are auditing-record, accounting-record and value-type, their mappings to Ada datatypes are defined directly (see 21.1, 22.1, 9.1 respectively).

PCTE composite and product datatypes (except composite datatypes with a single Token field, for such see 8.1.2) are mapped to the datatype generator *Record*. The component types of the composite or product type are mapped as defined by the rules of 8.1. The PCTE datatype *Message* is treated specially, see 14.1.

8.1.4 New LI datatype generators

Pcte-sequence

Description: *Pcte-sequence* is a datatype generator derived from *Sequence* by adding further characterizing operations. The values of a *pcte-sequence*, called its elements, are indexed sequentially from 1.

pcte-sequence of (*base*) = new sequence of (*base*)

The characterizing operations are: *Equal*, *IsEmpty*, *Head*, *Tail*, *Empty* and *Append* from *Sequence*, plus *Get*, *Put*, *Delete*, *InsertSequence*, *AppendSequence*, *LengthOf*, *IndexOf*, and *Normalize*.

Get (*s* : sequence of *base*, *i* : ordinal) : *base*
is the element of *s* with index *i*.

Put *s* : sequence of *base*, *e* : *base*, *i* : ordinal) : *base*
is the sequence formed from *s* by inserting *e* as an element of *s* immediately before the element with index *i*.

Delete (*s* : sequence of *base*, *i* : ordinal) : sequence of *base*
is the sequence formed from *s* by deleting the element with index *i*.

InsertSequence (*s1*, *s2* : sequence of *base*, *i* : ordinal) : sequence of *base*
 is the sequence formed from *s1* by inserting the sequence *s2* immediately before the element with index *i*.

AppendSequence (*s1*, *s2* : sequence of *base*) : sequence of *base*
 is the sequence formed from *s1* by appending the sequence *s2* at the end.

LengthOf (*s* : sequence of *base*) : natural
 is the number of elements of *s*.

IndexOf (*s* : sequence of *base*, *e* : *base*) : natural
 is the index of the first occurrence of the element *e* in the sequence *s* if the element is a member of the sequence, and 0 otherwise.

Normalize (*s* : sequence of *base*) : sequence of *base*
 is the sequence formed from *s* by ordering the elements in an implementation-defined canonical order and deleting duplicate elements.

Bounded-set

Description: Bounded-set is a datatype generator derived from *Set* by restricting the cardinality of the values to 32 or less.

bounded-set of *base* = new set of (*base*) : size (0 .. 32)

The characterizing operations are: *IsIn*, *Subset*, *Equal*, *Difference*, *Union*, *Intersection*, *Empty*, *SetOf*, *Select from Set*.

8.2 Mapping of LI datatypes to Ada datatypes

8.2.1 LI datatype: boolean

The LI datatype *boolean* is mapped to the boolean Ada datatype *Pcte.boolean*.

subtype boolean is STANDARD.BOOLEAN

Characterizing operations

Operation	Ada Operation
Equal (<i>x</i> , <i>y</i>)	<i>x</i> = <i>y</i>
Not (<i>x</i>)	not <i>x</i>
And (<i>x</i> , <i>y</i>)	<i>x</i> and <i>y</i>
Or (<i>x</i> , <i>y</i>)	<i>x</i> or <i>y</i>

8.2.2 LI datatype: pcte-integer

The LI datatype *pcte-integer* is mapped to the integer Ada datatype *Pcte.integer*.

type integer is

range MIN_INTEGER_ATTRIBUTE .. MAX_INTEGER_ATTRIBUTE;

Characterizing operations

Operation	Ada Operation
Equal (x, y)	$x = y$
Add (x, y)	$x + y$
Multiply (x, y)	$x * y$
Negate (x)	$-x$
NonNegative (x)	$x \geq 0$
InOrder (x, y)	$x \leq y$

8.2.3 LI datatype: pcte-natural

The LI datatype *pcte-natural* is mapped to the integer Ada datatype Pcte.natural.

type natural **is range** 0 .. Pcte.integer'LAST;

Characterizing operations

Operation	Ada Operation
Equal (x, y)	$x = y$
Add (x, y)	$x + y$
Multiply (x, y)	$x * y$
InOrder (x, y)	$x \leq y$

8.2.4 LI datatype: pcte-float

The LI datatype *pcte-float* is mapped to the Ada datatype Pcte.float.

type float **is digits** MAX_DIGITS_FLOAT_ATTRIBUTE
range MIN_FLOAT_ATTRIBUTE .. MAX_FLOAT_ATTRIBUTE;

Characterizing operations

Operation	Ada Operation
Equal (x,y)	$x = y$
Add (x, y)	$x + y$
Multiply (x, y)	$x * y$
Negate (x)	$-x$
Reciprocal (x)	$1.0/x$
NonNegative (x)	$x \geq 0.0$
InOrder (x,y)	$x \leq y$

8.2.5 LI datatype: pcte-time

The LI datatype *pcte-time* is mapped to the Ada datatype `Pcte.calendar.time`.

type time is private;

The range and accuracy of `Pcte.calendar.time` is implementation-defined but must respect the conditions for conformance with ISO/IEC 13719-1. Conversions are supported between `CALENDAR.TIME` and `Pcte.calendar.time`. A specific accuracy (year, month, day, hour, minute, second, fractions of a second) is obtained by using such components of `Pcte.calendar` as are required through the functions `year`, `month`, `day`, `seconds`, and `time_of`, and the procedure `split` in the Ada package `Pcte.calendar`, together with appropriate arithmetic for the determination of hours, minutes and seconds.

Characterizing operations

Operation	Ada Operation
Equal (x,y)	$x = y$
InOrder (x,y)	$x \leq y$
Difference (x,y)	$x - y$
Extend.res1tores2 (x)	<code>Pcte.calendar.extend (x)</code>
Round.res1tores2 (x)	<code>Pcte.calendar.round (x)</code>

8.2.6 LI datatype: octet

The LI datatype *octet* is mapped to the Ada datatype `STANDARD.CHARACTER`.

Characterizing operations

Operation	Ada Operation
Equal (x,y)	x = y

8.2.7 LI datatype: pcte-text

The LI datatype *pcte-text* is mapped to the Ada datatype *Pcte.text*.

subtype text is STANDARD.STRING;

Characterizing operations

Operation	Ada Operation
Head (s)	s(s'FIRST)
Tail (s)	s(s'FIRST+1 .. s'LAST)
Equal (s1, s2)	s1 = s2
Empty (s)	""
Append (s, c)	s & c
IsEmpty (s)	s'LENGTH = 0

8.2.8 LI datatype generator: pcte-sequence

The LI datatypes of the family *pcte-sequence* are mapped to types declared by Ada packages. In general, each LI datatype *sequence of xxx* is mapped to a package called *yyys* (the plural of *yyy*) where *yyy* is the mapping of *xxx*, e.g. for an arbitrary type named *element*:

package elements is

type sequence is limited private;

- The initial value of an object of type sequence is an empty sequence, i.e. one of
- length 0. To discard a sequence so that the associated storage can be recovered,
- all the elements of the sequence are deleted by means of procedure discard.

function get (

list : elements.sequence;

index : Pcte.natural := Pcte.natural'FIRST;

status : Pcte_error.handle := EXCEPTION_ONLY)

return element;

- elements.get returns the element with the given index in the given sequence. If the
- index is not less than the number of elements of the sequence, then the error
- INVALID_INDEX is raised.

procedure insert (

list : **in out** elements.sequence;
 item : **in** element;
 index : **in** Pcte.natural := Pcte.natural'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

- elements.insert inserts the given element in the given sequence immediately before
- the element with the given index, or if the index is not less than the number of
- elements of the sequence, the given element is appended after the last element.

procedure replace (

list : **in out** elements.sequence;
 item : **in** element;
 index : **in** Pcte.natural := Pcte.natural'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

- elements.replace replaces the element with the given index by the given element, or if
- the index is not less than the number of elements of the sequence, the given element
- is appended after the last element.

procedure append (

list : **in out** elements.sequence;
 item : **in** element;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

- elements.append appends the element to the sequence.

procedure delete (

list : **in out** elements.sequence;
 index : **in** Pcte.natural := Pcte.natural'FIRST;
 count : **in** Pcte.positive := Pcte.positive'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

- elements.delete deletes up to the given count elements from the element with the
- given index from the given sequence. The number of elements deleted is the lesser
- of count and the number of elements from the element of list with the given index to
- the end.

procedure copy (

into_list : **in out** elements.sequence;
 from_list : **in** elements.sequence;
 into_index : **in** Pcte.natural := Pcte.natural'LAST;
 from_index : **in** Pcte.natural := Pcte.natural'FIRST;
 count : **in** Pcte.positive := Pcte.positive'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

- elements.copy adds up to the given count elements from the element with index
- from_index of from_list to into_list. The elements are inserted immediately before
- the element of into_list with index into_index, or, if into_index is not less than the
- number of elements of into_list, are appended to the end of into_list. The number of
- elements added is the lesser of count and the number of elements from the element of
- from_list with index from_index to the end.

```

function length_of (
  list      : elements.sequence;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.natural;

-- elements.length_of returns the number of elements in the given sequence.

```

```

function index_of (
  list      : elements.sequence;
  item      : element;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.integer;

-- elements.index_of returns the index of the first occurrence of the given element in the
-- given sequence if the element is a member of the sequence, and -1 otherwise.

```

```

function are_equal (
  first      : elements.sequence;
  second     : elements.sequence;
  status     : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.boolean;

-- elements.are_equal returns TRUE if the two sequences first and second have the
-- same number of elements and their corresponding elements are equal, and FALSE
-- otherwise.

```

```

procedure normalize (
  list      : in out elements.sequence;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);

-- elements.normalize reorders the elements of the given sequence in an
-- implementation-defined canonical order, and deletes any duplicate elements.

```

```

procedure discard (
  list      : in out elements.sequence;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

private
  implementation-defined
end elements;

```

The Ada generated datatype sequence declared by the package is limited private. Objects of this type may only be manipulated by the subprograms defined in that package; in particular:

- assignment is not supported;
- all elements of such objects always have defined values.

Characterizing operations

Operation	Ada Operation
Equal(s1,s2)	are_equal(s1, s2)
Head(s)	get(s)
IsEmpty(s)	length_of(s) = 0
s:=Tail(s)	delete(s,1,1);
s:=Append(s,e)	append(s,e);
s:=Empty()	delete(s);
Get(s,i)	get(s,i)
s:=Put(s,e,i)	insert(s,e,i);
s:=Delete(s,i)	delete(s,i,1);
s1:=InsertSequence(s1,s2,i)	copy(s1,s2,i);
s1:=AppendSequence(s1,s2)	copy(s1,s2);
LengthOf(s)	length_of(s)
IsMember(s,e)	index_of(s,e) /= 0
s:=Normalize(s)	normalize(s);

8.2.9 LI datatype generator: bounded-set

The LI datatype *bounded-set of base* is mapped to an Ada datatype defined as an array of Pcte.boolean, with an enumeration index type mapping the names of element values to positions in the array. Each LI datatype *bounded set of xxx* is mapped to an Ada datatype called *set_of_xxxs* (where xxxs is the plural of xxx). An array value of the Ada datatype represents a set including a element value if the corresponding entry in the array has the value TRUE. Thus a bounded set of base type xxx with possible element values VAL1, VAL2, ... VALn is mapped as follows:

type xxx is (VAL1, VAL2, ... VALn);

type xxxs is array (xxx) **of** Pcte.boolean;

Characterizing operations

Operation	Ada Operation
IsIn (s,e)	s (e)
Subset (s1,s2)	for i in xxx loop if s1(i) and not s2(i) then return FALSE; end if ; end loop ; return TRUE;
Equal (s1,s2)	s1 = s2
Difference (s1, s2)	s1 and not s2
Union (s1,s2)	s1 or s2
Intersection (s1,s2)	s1 and s2
Empty ()	xxxxs'(others => FALSE)
SetOf (e)	xxxxs'(e => TRUE, others => FALSE)
Select (s)	j : xxx; for i in xxx loop j := i; exit when s(j); end loop ; return j;

8.2.10 LI datatype: record.

The LI record datatype xxx = *record of* (COMPONENT-1: type-1, COMPONENT-2: type-2, ...) is mapped to the Ada record datatype:

```

type xxx is record
    component_1:  type_1;
    component_2:  type_2;
    component_3:  type_3;
    ...;
end record;

```

Characterizing operations

Operation	Ada Operation
Equal (x, y)	x = y
FieldSelect.component (x)	x.component;
Aggregate (component_1, component_2, ...)	(component_1, component_2, ...)

8.2.11 LI datatype: private

The LI datatype private is mapped in each case to an Ada private type.

8.2.12 LI enumerated datatype: pcte-xxx

The LI datatype *pcte-xxx*, defined as *enumerated (val1, val2, ...)*, corresponds to the PCTE enumeration datatype xxx (where the values of xxx are VAL1, VAL2, ...). It is mapped to the Ada datatype xxx, defined as follows.

type xxx **is** (VAL1, VAL2, ...);

Characterizing operations

Operation	Ada Operation
Equal (x, y)	x = y
InOrder (x, y)	x <= y
Successor (x)	x'SUCC

8.3 Deriving Ada subprogram semantics from the abstract specification

Each Ada subprogram corresponds to the abstract operation in ISO/IEC 13719-1 whose name precedes the subprogram declaration, as a comment with the form of a clause heading from ISO/IEC 13719-1 e.g.: -- 11.2.9 VOLUME_MOUNT.

In cases where there is not a one-to-one correspondence between abstract operations and Ada subprograms, an explanation is given as a comment before the first Ada subprogram declaration. Where Ada subprogram declarations are out of the order with respect to order of ISO/IEC 13719-1, a cross-reference is given.

The semantics of an Ada subprogram is generally the same as that of the corresponding abstract operation, and is derived as follows in general. Any exceptions are described where they occurs in clause 9 to 22.

- Ada formal parameters of mode **in** correspond to abstract operation parameters of the same names.

- Ada formal parameter types correspond to the PCTE datatypes of the corresponding abstract operation parameters as defined in clause 8.
- Returned values corresponding to results of abstract operations are returned either as function results or as parameters of mode **out** or **in out**. In the latter case, if the result of an operation is a single non-optional value, then the Ada result parameter has the same name.
- Where an abstract operation has optional parameters, and in other cases where the above rules cannot be applied, an explanation is in general given as a comment immediately after the subprogram declaration. There are two general methods of mapping optional parameters and results where no explanation is given with the subprogram. One is where an optional parameter is of a string type and its absence is indicated by providing an empty string value. The other is where an optional parameter or result is dealt with by providing two overloaded subprograms, one with and one without the corresponding parameter.
- In order to use good Ada style, formal parameters with default values (corresponding to optional parameters of the abstract operation) are placed at the end of the parameter list. Otherwise the order of parameters is the same as for the abstract operation.
- In general the names of parameters and results are the same as in the abstract operation. Where that is not possible, because the name in the abstract operation is an Ada reserved word, or in the case of the name 'status' which is used specially in the Ada Binding, the characters 'pcte_' are prefixed to the name in the abstract operation.
- A parameter or result of a union type (excluding enumeration types) is usually handled by providing a set of overloaded subprograms, one for each member of the type union. No explanation is given with the subprogram declarations for such cases.
- Threads in the Abstract Specification are mapped onto tasks in the Ada binding. A single PCTE process executes by the execution of a single Ada program, even when that program includes multiple tasks. Within the process, Ada tasks execute in parallel (proceed independently) in accordance with the rules in ISO 8652 9(5).
- When a task executes a PCTE operation which depends on the occurrence of some event, that task is suspended pending the occurrence of that event. In this case, other tasks may continue to execute and to execute PCTE operations, subject to the Ada tasking rules. The suspended task has no delaying effect on other PCTE operations if the operations to be performed are unrelated.

8.4 Package Pcte

with Pcte_error, CALENDAR;

package Pcte is

use Pcte_error

----- PCTE basic types -----

subtype boolean **is** STANDARD.BOOLEAN;

-- Pcte.boolean corresponds to the PCTE datatype Boolean.

type integer **is range** *implementation-defined*;

-- Pcte.integer corresponds to the PCTE datatype Integer.
type natural **is range** 0 .. Pcte.integer'LAST;
 -- Pcte.natural corresponds to the PCTE datatype Natural.
type float **is digits** *implementation-defined* **range** *implementation-defined*;
 -- Pcte.float corresponds to the PCTE datatype Float.
subtype text **is** STANDARD.STRING;
 -- Pcte.text corresponds to the PCTE datatype Text.
subtype string **is** STANDARD.STRING;
subtype string_length **is** STANDARD.NATURAL;
 -- Pcte.string corresponds to the PCTE datatype String.
subtype key **is** Pcte.text;
 -- Pcte.key corresponds to the PCTE datatype Key.
subtype actual_key **is** Pcte.text;
 -- Pcte.actual_key corresponds to the PCTE datatype Actual_key.
subtype link_name **is** Pcte.text;
 -- Pcte.link_name corresponds to the PCTE datatype Link_name.
subtype name **is** Pcte.text;
 -- Pcte.name corresponds to the PCTE datatype Name.
subtype type_name **is** Pcte.text;
 -- Pcte.type_name corresponds to the PCTE datatype Type_name.
subtype type_name_in_sds **is** Pcte.text (1..MAX_NAME_SIZE);
 -- Pcte.type_name corresponds to the PCTE datatype Type_name_in_sds.
subtype positive **is** STANDARD.POSITIVE;
 -- Pcte.positive is used to define a character position within Pcte.string or Pcte.text.
package calendar **is**
 type time **is private**;
 -- Pcte.calendar.time corresponds to the PCTE datatype Time; it is an Ada private
 -- type defined with its associated subprograms in this package Pcte.calendar. The
 -- subtypes and subprograms have the same meanings as their namesakes in package
 -- CALENDAR.
 DEFAULT_TIME: **constant** time;
 Pcte.calendar.DEFAULT_TIME is the default value of time attributes.
 subtype year_number **is** STANDARD.CALENDAR.YEAR_NUMBER
 range 1980 .. 2044;

subtype month_number **is** STANDARD.CALENDAR.MONTH_NUMBER;

subtype day_number **is** STANDARD.CALENDAR.DAY_NUMBER;

subtype day_duration **is** STANDARD.CALENDAR.DAY_DURATION;

function clock **return** Pcte.calendar.time;

function year (
 date : Pcte.calendar.time)
 return Pcte.calendar.year_number;

function month (
 date : Pcte.calendar.time)
 return Pcte.calendar.month_number;

function day (
 date : Pcte.calendar.time)
 return Pcte.calendar.day_number;

function seconds (
 date : Pcte.calendar.time)
 return Pcte.calendar.day_duration;

procedure split (
 date : **in** Pcte.calendar.time;
 year : **out** Pcte.calendar.year_number;
 month : **out** Pcte.calendar.month_number;
 day : **out** Pcte.calendar.day_number;
 seconds : **out** Pcte.calendar.day_duration);

function time_of (
 year : Pcte.calendar.year_number;
 month : Pcte.calendar.month_number;
 day : Pcte.calendar.day_number;
 seconds : Pcte.calendar.day_duration := 0.0)
 return Pcte.calendar.time;

function "+" (
 left : Pcte.calendar.time;
 right : STANDARD.DURATION)
 return Pcte.calendar.time;

function "+" (
 left : STANDARD.DURATION;
 right : Pcte.calendar.time)
 return Pcte.calendar.time;

function "-" (
 left : Pcte.calendar.time;
 right : STANDARD.DURATION)
 return Pcte.calendar.time;

```

function "-" (
  left      : Pcte.calendar.time;
  right     : Pcte.calendar.time)
return     STANDARD.DURATION;

function "<" (
  left      : Pcte.calendar.time;
  right     : Pcte.calendar.time)
return     Pcte.boolean;

function "<=" (
  left      : Pcte.calendar.time;
  right     : Pcte.calendar.time)
return     Pcte.boolean;

function ">" (
  left      : Pcte.calendar.time;
  right     : Pcte.calendar.time)
return     Pcte.boolean;

function ">=" (
  left      : Pcte.calendar.time;
  right     : Pcte.calendar.time)
return     Pcte.boolean;

function extend (
  date      : Pcte.calendar.time)
return     STANDARD.CALENDAR.TIME;

-- Pcte.calendar.extend converts the value of the parameter date to the type
-- CALENDAR.TIME.

function round (
  date      : STANDARD.CALENDAR.TIME)
return     Pcte.calendar.time;

-- Pcte.calendar.round converts the value of the parameter date to the type
-- Pcte.calendar.time.

TIME_ERROR : exception renames STANDARD.CALENDAR.TIME_ERROR;

private
  implementation-defined
end calendar;

```

----- PCTE references -----

package reference is

```

type  object_ref  is limited private;
type  link_ref    is limited private;
type  type_ref    is limited private;

```

```

subtype attribute_ref is type_ref;
CURRENT_PROCESS      : constant Pcte.reference.object_ref;
LOCAL_WORKSTATION    : constant Pcte.reference.object_ref;
LOCAL_EXECUTION_SITE : constant Pcte.reference.object_ref;
subtype pathname is Pcte.string;
-- Pcte.reference.pathname corresponds to the PCTE datatype Pathname.
subtype relative_pathname is Pcte.string;
-- Pcte.reference.relative_pathname corresponds to the PCTE datatype
-- Relative_pathname.
type evaluation_point is (NOW, FIRST_USE, EVERY_USE);
-- Pcte.reference.evaluation_point corresponds to the PCTE datatype
-- Evaluation_point.
type evaluation_status is (INTERNAL, EXTERNAL, UNDEFINED);
-- Pcte.reference.evaluation_status corresponds to the PCTE datatype
-- Evaluation_status. The value UNDEFINED is binding-defined and signifies an
-- object reference which is unset.
type reference_equality is (EQUAL_REFS, UNEQUAL_REFS, EXTERNAL_REFS);
-- Pcte.reference.reference_equality corresponds to the PCTE datatype
-- Reference_equality.
type key_kind is (NATURAL_KEY, STRING_KEY);
type key_value (
    kind      : Pcte.reference.key_kind := NATURAL_KEY;
    string_length : Pcte.string_length := 0)
is record
    case kind is
        when NATURAL_KEY => natural_value : Pcte.natural;
        when STRING_KEY => string_value   : Pcte.text (1..string_length);
    end case;
end record;

```

----- Object Reference Operations -----

-- 23.2.1 OBJECT_REFERENCE_COPY

```

procedure copy (
    reference      : in    Pcte.reference.object_ref;
    point          : in    Pcte.reference.evaluation_point;
    new_reference  : out   Pcte.reference.object_ref;
    status         : in    Pcte_error.handle := EXCEPTION_ONLY);

```

-- 23.2.2 OBJECT_REFERENCE_GET_EVALUATION_POINT

```
function get_evaluation_point (
  reference : Pcte.reference.object_ref;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.reference.evaluation_point;
```

-- 23.2.3 OBJECT_REFERENCE_GET_PATH

```
function get_path (
  reference : Pcte.reference.object_ref;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.reference.pathname;
```

-- 23.2.4 OBJECT_REFERENCE_GET_STATUS

```
function get_status (
  reference : Pcte.reference.object_ref;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.reference.evaluation_status;
```

-- 23.2.5 OBJECT_REFERENCE_SET_ABSOLUTE

```
procedure set_absolute (
  pathname      : in    Pcte.reference.pathname;
  point         : in    Pcte.reference.evaluation_point;
  new_reference : out   Pcte.reference.object_ref;
  status        : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 23.2.6 OBJECT_REFERENCE_SET_RELATIVE

```
procedure set_relative (
  reference      : in    Pcte.reference.object_ref;
  pathname       : in    Pcte.reference.relative_pathname;
  point         : in    Pcte.reference.evaluation_point;
  new_reference  : out   Pcte.reference.object_ref;
  status        : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 23.2.7 OBJECT_REFERENCE_UNSET

```
procedure unset (
  reference : in out Pcte.reference.object_ref;
  status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 23.2.8 OBJECT_REFERENCES_ARE_EQUAL

```
function are_equal (
  first_reference : Pcte.reference.object_ref;
  second_reference : Pcte.reference.object_ref;
  status          : Pcte_error.handle := EXCEPTION_ONLY)
return           Pcte.reference.reference_equality;
```

----- Link Reference Operations -----

-- 23.3.1 LINK_REFERENCE_COPY

procedure copy (

reference : **in** Pcte.reference.link_ref;
point : **in** Pcte.reference.evaluation_point;
new_reference : **out** Pcte.reference.link_ref;
status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 23.3.2 LINK_REFERENCE_GET_EVALUATION_POINT

function get_evaluation_point (

reference : Pcte.reference.link_ref;
status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte.reference.evaluation_point;

-- 23.3.3 LINK_REFERENCE_GET_KEY

function get_key (

reference : Pcte.reference.link_ref;
status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte.key;

-- 23.3.4 LINK_REFERENCE_GET_KEY_VALUE

function get_key_value (

reference : Pcte.reference.link_ref;
index : Pcte.natural;
status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte.reference.key_value;

-- 23.3.5 LINK_REFERENCE_GET_NAME

function get_name (

reference : Pcte.reference.link_ref;
status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte.link_name;

-- 23.3.6 LINK_REFERENCE_GET_STATUS

function get_status (

reference : Pcte.reference.link_ref;
status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte.reference.evaluation_status;

-- 23.3.7 LINK_REFERENCE_GET_TYPE

procedure get_type (

reference : **in** Pcte.reference.link_ref;
type_reference : **out** Pcte.reference.type_ref;
status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 23.3.8 LINK_REFERENCE_SET

```
procedure set (
  link_name      : in    Pcte.link_name;
  point          : in    Pcte.reference.evaluation_point;
  new_reference  : out   Pcte.reference.link_ref;
  status         : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure set (
  link_name      : in    Pcte.reference.type_ref;
  point          : in    Pcte.reference.evaluation_point;
  new_reference  : out   Pcte.reference.link_ref;
  status         : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure set (
  link_name      : in    Pcte.reference.type_ref;
  link_key       : in    Pcte.key;
  point          : in    Pcte.reference.evaluation_point;
  new_reference  : out   Pcte.reference.link_ref;
  status         : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 23.3.9 LINK_REFERENCE_UNSET

```
procedure unset (
  reference : in out Pcte.reference.link_ref;
  status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 23.3.10 LINK_REFERENCES_ARE_EQUAL

```
function are_equal (
  first_reference  : Pcte.reference.link_ref;
  second_reference : Pcte.reference.link_ref;
  status           : Pcte_error.handle := EXCEPTION_ONLY)
return            Pcte.reference.reference_equality;
```

Type reference operations

-- 23.4.1 TYPE_REFERENCE_COPY

```
procedure copy (
  reference      : in    Pcte.reference.type_ref;
  point          : in    Pcte.reference.evaluation_point;
  new_reference  : out   Pcte.reference.type_ref;
  status         : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 23.4.2 TYPE_REFERENCE_GET_EVALUATION_POINT

```
function get_evaluation_point (
  reference : Pcte.reference.type_ref;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.reference.evaluation_point;
```

-- 23.4.3 TYPE_REFERENCE_GET_IDENTIFIER

```
function get_identifier (
    reference : Pcte.reference.type_ref;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.type_name;
```

-- 23.4.4 TYPE_REFERENCE_GET_NAME

```
function get_name (
    reference : Pcte.reference.type_ref;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.type_name;
```

```
function get_name (
    sds       : Pcte.reference.object_ref;
    reference : Pcte.reference.type_ref;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.type_name;
```

-- 23.4.5 TYPE_REFERENCE_GET_STATUS

```
function get_status (
    reference : Pcte.reference.type_ref;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.reference.evaluation_status;
```

-- 23.4.6 TYPE_REFERENCE_SET

```
procedure set (
    name       : in      Pcte.type_name;
    point      : in      Pcte.reference.evaluation_point;
    new_reference : out   Pcte.reference.type_ref;
    status     : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 23.4.7 TYPE_REFERENCE_UNSET

```
procedure unset (
    reference : in out   Pcte.reference.type_ref;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 23.4.8 TYPE_REFERENCES_ARE_EQUAL

```
function are_equal (
    first_reference : Pcte.reference.type_ref;
    second_reference : Pcte.reference.type_ref;
    status          : Pcte_error.handle := EXCEPTION_ONLY)
return            Pcte.reference.reference_equality;
```

private

implementation-defined

end reference;

subtype object_reference **is** Pcte.reference.object_ref;

subtype type_reference **is** Pcte.reference.type_ref;

subtype link_reference **is** Pcte.reference.link_ref;

subtype attribute_reference **is** Pcte.reference.attribute_ref;

-- These types correspond to the PCTE datatypes X_reference.

----- PCTE types related to attributes -----

type enumeral_position **is range** 0 .. Pcte.natural'LAST;

type value_type **is** (INTEGER_TYPE, NATURAL_TYPE, BOOLEAN_TYPE, TIME_TYPE, FLOAT_TYPE, STRING_TYPE, ENUMERAL_TYPE);

-- Pcte.value_type corresponds to the PCTE datatype Value_type. ENUMERAL_TYPE

-- indicates an enumeral type, defined by its position in the corresponding attribute type.

type attribute_value (
 type_is : Pcte.value_type := INTEGER_TYPE;
 string_length : Pcte.string_length := 0)

is record
 case type_is **is**
 when BOOLEAN_TYPE =>
 boolean_value : Pcte.boolean;
 when NATURAL_TYPE =>
 natural_value : Pcte.natural;
 when INTEGER_TYPE =>
 integer_value : Pcte.integer;
 when FLOAT_TYPE =>
 float_value : Pcte.float;
 when TIME_TYPE =>
 time_value : Pcte.calendar.time;
 when STRING_TYPE =>
 string_value : Pcte.string(1..string_length);
 when ENUMERAL_TYPE =>
 enumeral_value : Pcte.enumeral_position;
 end case;
end record;

type attribute_assignment (
 type_is : Pcte.value_type := INTEGER_TYPE;
 string_length : Pcte.string_length := 0)

is record
 attribute : Pcte.type_reference;
 value : Pcte.attribute_value(type_is, string_length);
end record;

- Pcte.attribute_assignment corresponds to the PCTE datatype Attribute_assignment.
- Pcte.attribute_value is the type of the value field, and is discriminated by the type of the attribute value.

----- PCTE types related to links -----

type category **is** (COMPOSITION_LINK, EXISTENCE_LINK, REFERENCE_LINK, DESIGNATION_LINK, IMPLICIT_LINK);

- Pcte.category corresponds to the PCTE datatype Category.

type categories **is array** (Pcte.category) **of** Pcte.boolean;

- Pcte.categories corresponds to the PCTE datatype Categories.

type object_scope **is** (ATOMIC, COMPOSITE);

- Pcte.object_scope corresponds to the PCTE datatype Object_scope.

----- PCTE types related to objects -----

subtype exact_identifier **is** Pcte.text;

- Pcte.exact_identifier corresponds to the PCTE datatype Exact_identifier.

----- sequence packages -----

- The semantics of the operations of these packages are defined in 8.2.8.

package object_references **is**

type sequence **is limited private**;

- Pcte.object_references.sequence corresponds to the PCTE datatype Object_references.

function get (

list : Pcte.object_references.sequence;
index : Pcte.natural := Pcte.natural'FIRST;
status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte.object_reference;

procedure insert (

list : **in out** Pcte.object_references.sequence;
item : **in** Pcte.object_reference;
index : **in** Pcte.natural := Pcte.natural'LAST;
status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure replace (

list : **in out** Pcte.object_references.sequence;
item : **in** Pcte.object_reference;
index : **in** Pcte.natural := Pcte.natural'LAST;
status : **in** Pcte_error.handle := EXCEPTION_ONLY);

```

procedure append (
    list      : in out  Pcte.object_references.sequence;
    item      : in      Pcte.object_reference;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

procedure delete (
    list      : in out  Pcte.object_references.sequence;
    index     : in      Pcte.natural := Pcte.natural'FIRST;
    count     : in      Pcte.positive := Pcte.positive'LAST;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

procedure copy (
    into_list  : in out  Pcte.object_references.sequence;
    from_list  : in      Pcte.object_references.sequence;
    into_index : in      Pcte.natural := Pcte.natural'LAST;
    from_index : in      Pcte.natural := Pcte.natural'FIRST;
    count      : in      Pcte.positive := Pcte.positive'LAST;
    status     : in      Pcte_error.handle := EXCEPTION_ONLY);

function length_of (
    list      : Pcte.object_references.sequence;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.natural;

function index_of (
    list      : Pcte.object_references.sequence;
    item      : Pcte.object_reference;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.integer;

function are_equal (
    first     : Pcte.object_references.sequence;
    second    : Pcte.object_references.sequence;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.boolean;

procedure normalize (
    list      : in out  Pcte.object_references.sequence;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

procedure discard (
    list      : in out  Pcte.object_references.sequence;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

private
    implementation-defined

end object_references;

package link_references is
    type sequence is limited private;

```

-- Pcte.link_references.sequence corresponds to the PCTE datatype Link_references.

function get (

list : Pcte.link_references.sequence;
 index : Pcte.natural := Pcte.natural'FIRST;
 status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte.link_reference;

procedure insert (

list : **in out** Pcte.link_references.sequence;
 item : **in** Pcte.link_reference;
 index : **in** Pcte.natural := Pcte.natural'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure replace (

list : **in out** Pcte.link_references.sequence;
 item : **in** Pcte.link_reference;
 index : **in** Pcte.natural := Pcte.natural'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure append (

list : **in out** Pcte.link_references.sequence;
 item : **in** Pcte.link_reference;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure delete (

list : **in out** Pcte.link_references.sequence;
 index : **in** Pcte.natural := Pcte.natural'FIRST;
 count : **in** Pcte.positive := Pcte.positive'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure copy (

into_list : **in out** Pcte.link_references.sequence;
 from_list : **in** Pcte.link_references.sequence;
 into_index : **in** Pcte.natural := Pcte.natural'LAST;
 from_index : **in** Pcte.natural := Pcte.natural'FIRST;
 count : **in** Pcte.positive := Pcte.positive'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

function length_of (

list : Pcte.link_references.sequence;
 status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte.natural;

function index_of (

list : Pcte.link_references.sequence;
 item : Pcte.link_reference;
 status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte.integer;

```

function are_equal (
    first      : Pcte.link_references.sequence;
    second     : Pcte.link_references.sequence;
    status     : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.boolean;

procedure normalize (
    list       : in out Pcte.link_references.sequence;
    status     : in      Pcte_error.handle := EXCEPTION_ONLY);

procedure discard (
    list       : in out Pcte.link_references.sequence;
    status     : in      Pcte_error.handle := EXCEPTION_ONLY);

private
    implementation-defined

end link_references;

package type_references is
    type sequence is limited private;
    -- Pcte.type_references.sequence corresponds to the PCTE datatype Type_references.

    function get (
        list      : Pcte.type_references.sequence;
        index     : Pcte.natural := Pcte.natural'FIRST;
        status    : Pcte_error.handle := EXCEPTION_ONLY)
        return    Pcte.type_reference;

    procedure insert (
        list      : in out Pcte.type_references.sequence;
        item      : in      Pcte.type_reference;
        index     : in      Pcte.natural := Pcte.natural'LAST;
        status    : in      Pcte_error.handle := EXCEPTION_ONLY);

    procedure replace (
        list      : in out Pcte.type_references.sequence;
        item      : in      Pcte.type_reference;
        index     : in      Pcte.natural := Pcte.natural'LAST;
        status    : in      Pcte_error.handle := EXCEPTION_ONLY);

    procedure append (
        list      : in out Pcte.type_references.sequence;
        item      : in      Pcte.type_reference;
        status    : in      Pcte_error.handle := EXCEPTION_ONLY);

    procedure delete (
        list      : in out Pcte.type_references.sequence;
        index     : in      Pcte.natural := Pcte.natural'FIRST;
        count     : in      Pcte.positive := Pcte.positive'LAST;
        status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure copy (
  into_list      : in out  Pcte.type_references.sequence;
  from_list      : in       Pcte.type_references.sequence;
  into_index     : in       Pcte.natural := Pcte.natural'LAST;
  from_index     : in       Pcte.natural := Pcte.natural'FIRST;
  count          : in       Pcte.positive := Pcte.positive'LAST;
  status         : in       Pcte_error.handle := EXCEPTION_ONLY);

```

```

function length_of (
  list          : Pcte.type_references.sequence;
  status        : Pcte_error.handle := EXCEPTION_ONLY)
return         Pcte.natural;

```

```

function index_of (
  list          : Pcte.type_references.sequence;
  item          : Pcte.type_reference;
  status        : Pcte_error.handle := EXCEPTION_ONLY)
return         Pcte.integer;

```

```

function are_equal (
  first         : Pcte.type_references.sequence;
  second        : Pcte.type_references.sequence;
  status        : Pcte_error.handle := EXCEPTION_ONLY)
return         Pcte.boolean;

```

```

procedure normalize (
  list          : in out  Pcte.type_references.sequence;
  status        : in       Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure discard (
  list          : in out  Pcte.type_references.sequence;
  status        : in       Pcte_error.handle := EXCEPTION_ONLY);

```

private

implementation-defined

end type_references;

package type_names_in_sds **is**

type sequence **is limited private**;

```

-- Pcte.type_names_in_sds.sequence corresponds to the PCTE datatype
-- Type_names_in_sds.

```

```

function get (
  list          : Pcte.type_names_in_sds.sequence;
  index         : Pcte.natural := Pcte.natural'FIRST;
  status        : Pcte_error.handle := EXCEPTION_ONLY)
return         Pcte.type_name_in_sds;

```

```

procedure insert (
    list      : in out    Pcte.type_names_in_sds.sequence;
    item      : in        Pcte.type_name_in_sds;
    index     : in        Pcte.natural := Pcte.natural'LAST;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

procedure replace (
    list      : in out    Pcte.type_names_in_sds.sequence;
    item      : in        Pcte.type_name_in_sds;
    index     : in        Pcte.natural := Pcte.natural'LAST;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

procedure append (
    list      : in out    Pcte.type_names_in_sds.sequence;
    item      : in        Pcte.type_name_in_sds;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

procedure delete (
    list      : in out    Pcte.type_names_in_sds.sequence;
    index     : in        Pcte.natural := Pcte.natural'FIRST;
    count     : in        Pcte.positive := Pcte.positive'LAST;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

procedure copy (
    into_list  : in out    Pcte.type_names_in_sds.sequence;
    from_list  : in        Pcte.type_names_in_sds.sequence;
    into_index : in        Pcte.natural := Pcte.natural'LAST;
    from_index : in        Pcte.natural := Pcte.natural'FIRST;
    count      : in        Pcte.positive := Pcte.positive'LAST;
    status     : in        Pcte_error.handle := EXCEPTION_ONLY);

function length_of (
    list      : Pcte.type_names_in_sds.sequence;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.natural;

function index_of (
    list      : Pcte.type_names_in_sds.sequence;
    item      : Pcte.type_name_in_sds;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.integer;

function index_of (
    list      : Pcte.type_names_in_sds.sequence;
    item      : Pcte.type_name_in_sds;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.integer;

procedure normalize (
    list      : in out    Pcte.type_names_in_sds.sequence;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure discard (
    list      : in out  Pcte.type_names_in_sds.sequence;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

private

implementation-defined

end type_names_in_sds;

package attribute_references **is**

type sequence **is limited private**;

-- Pcte.attribute_references.sequence corresponds to the PCTE datatype
 -- Attribute_references.

```

function get (
    list      : Pcte.attribute_references.sequence;
    index     : Pcte.natural := Pcte.natural'FIRST;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.attribute_reference;

```

```

procedure insert (
    list      : in out  Pcte.attribute_references.sequence;
    item      : in      Pcte.attribute_reference;
    index     : in      Pcte.natural := Pcte.natural'LAST;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure replace (
    list      : in out  Pcte.attribute_references.sequence;
    item      : in      Pcte.attribute_reference;
    index     : in      Pcte.natural := Pcte.natural'LAST;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure append (
    list      : in out  Pcte.attribute_references.sequence;
    item      : in      Pcte.attribute_reference;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure delete (
    list      : in out  Pcte.attribute_references.sequence;
    index     : in      Pcte.natural := Pcte.natural'FIRST;
    count     : in      Pcte.positive := Pcte.positive'LAST;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure copy (
    into_list : in out  Pcte.attribute_references.sequence;
    from_list : in      Pcte.attribute_references.sequence;
    into_index : in      Pcte.natural := Pcte.natural'LAST;
    from_index : in      Pcte.natural := Pcte.natural'FIRST;
    count     : in      Pcte.positive := Pcte.positive'LAST;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

function length_of (
  list      : Pcte.attribute_references.sequence;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.natural;

function index_of (
  list      : Pcte.attribute_references.sequence;
  item      : Pcte.attribute_reference;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.integer;

function are_equal (
  first     : Pcte.attribute_references.sequence;
  second    : Pcte.attribute_references.sequence;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.boolean;

procedure normalize (
  list      : in out Pcte.attribute_references.sequence;
  status    : in     Pcte_error.handle := EXCEPTION_ONLY);

procedure discard (
  list      : in out Pcte.attribute_references.sequence;
  status    : in     Pcte_error.handle := EXCEPTION_ONLY);

private
  implementation-defined

end attribute_references;

package attribute_assignments is
  type sequence is limited private;
  -- Pcte.attribute_assignments.sequence corresponds to the PCTE datatype
  -- Attribute_assignments.

  function get (
    list      : Pcte.attribute_assignments.sequence;
    index     : Pcte.natural := Pcte.natural'FIRST;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.attribute_assignment;

  procedure insert (
    list      : in out Pcte.attribute_assignments.sequence;
    item      : in     Pcte.attribute_assignment;
    index     : in     Pcte.natural := Pcte.natural'LAST;
    status    : in     Pcte_error.handle := EXCEPTION_ONLY);

```



```

procedure replace (
  list      : in out  Pcte.attribute_assignments.sequence;
  item      : in      Pcte.attribute_assignment;
  index     : in      Pcte.natural := Pcte.natural'LAST;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure append (
  list      : in out  Pcte.attribute_assignments.sequence;
  item      : in      Pcte.attribute_assignment;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure delete (
  list      : in out  Pcte.attribute_assignments.sequence;
  index     : in      Pcte.natural := Pcte.natural'FIRST;
  count     : in      Pcte.positive := Pcte.positive'LAST;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure copy (
  into_list : in out  Pcte.attribute_assignments.sequence;
  from_list : in      Pcte.attribute_assignments.sequence;
  into_index : in      Pcte.natural := Pcte.natural'LAST;
  from_index : in      Pcte.natural := Pcte.natural'FIRST;
  count     : in      Pcte.positive := Pcte.positive'LAST;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

function length_of (
  list      : Pcte.attribute_assignments.sequence;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.natural;

```

```

function index_of (
  list      : Pcte.attribute_assignments.sequence;
  item      : Pcte.attribute_assignment;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.integer;

```

```

function are_equal (
  first     : Pcte.attribute_assignments.sequence;
  second    : Pcte.attribute_assignments.sequence;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.boolean;

```

```

procedure normalize (
  list      : in out  Pcte.attribute_assignments.sequence;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure discard (
  list      : in out  Pcte.attribute_assignments.sequence;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

private

implementation-defined

```

    end attribute_assignments;
end Pcte;

```

9 Object management

9.1 Object management datatypes

```
-- See the beginning of the packages Pcte_link, Pcte_object and Pcte_version.
```

9.2 Link operations

```
with Pcte, Pcte_error, Pcte_archive, Pcte_volume;
```

```
package Pcte_link is
```

```
    use Pcte, Pcte.calendar, Pcte_error;
```

```
-- 9.2.1 LINK_CREATE
```

```
procedure create (
```

```
    origin      : in Pcte.object_reference;
```

```
    new_link    : in Pcte.link_reference;
```

```
    dest        : in Pcte.object_reference;
```

```
    reverse_key : in Pcte.actual_key := "";
```

```
    status      : in Pcte_error.handle := EXCEPTION_ONLY);
```

```
-- 9.2.2 LINK_DELETE
```

```
procedure delete (
```

```
    origin : in Pcte.object_reference;
```

```
    link   : in Pcte.link_reference;
```

```
    status : in Pcte_error.handle := EXCEPTION_ONLY);
```

```
-- 9.2.3 LINK_DELETE_ATTRIBUTE
```

```
procedure delete_attribute (
```

```
    origin : in Pcte.object_reference;
```

```
    link   : in Pcte.link_reference;
```

```
    attribute : in Pcte.attribute_reference;
```

```
    status   : in Pcte_error.handle := EXCEPTION_ONLY);
```

```
-- 9.2.4 LINK_GET_ATTRIBUTE
```

```
-- LINK_GET_ATTRIBUTE is mapped to overloaded versions of the function
-- Pcte_link.get_attribute, one for each possible type of the result. If the type of
-- the result of the particular overloaded function that is used is different from the
-- type of its parameter attribute, then the error VALUE_TYPE_IS_INVALID is
-- raised.
```

```

function get_attribute (
    origin      : Pcte.object_reference;
    link        : Pcte.link_reference;
    attribute    : Pcte.attribute_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.boolean;

```

```

function get_attribute (
    origin      : Pcte.object_reference;
    link        : Pcte.link_reference;
    attribute    : Pcte.attribute_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.integer;

```

```

function get_attribute (
    origin      : Pcte.object_reference;
    link        : Pcte.link_reference;
    attribute    : Pcte.attribute_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.natural;

```

```

function get_attribute (
    origin      : Pcte.object_reference;
    link        : Pcte.link_reference;
    attribute    : Pcte.attribute_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.float;

```

```

function get_attribute (
    origin      : Pcte.object_reference;
    link        : Pcte.link_reference;
    attribute    : Pcte.attribute_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.calendar.time;

```

```

function get_attribute (
    origin      : Pcte.object_reference;
    link        : Pcte.link_reference;
    attribute    : Pcte.attribute_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.enumeral_position;

```

```

function get_attribute (
    origin      : Pcte.object_reference;
    link        : Pcte.link_reference;
    attribute    : Pcte.attribute_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.string;

```

-- 9.2.5 LINK_GET_DESTINATION_VOLUME

```
function get_destination_volume (
    origin      : Pcte.object_reference;
    link        : Pcte.link_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return       Pcte_volume.volume_info;
```

-- 9.2.6 LINK_GET_KEY

```
function get_key (
    origin      : Pcte.object_reference;
    link        : Pcte.link_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return       Pcte.actual_key;
```

-- 9.2.7 LINK_GET_REVERSE

```
procedure get_reverse (
    origin      : in      Pcte.object_reference;
    link        : in      Pcte.link_reference;
    reverse_link : in out Pcte.link_reference;
    dest        : in out Pcte.object_reference;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 9.2.8 LINK_GET_SEVERAL_ATTRIBUTES

-- The effect of assigning VISIBLE_ATTRIBUTE_TYPES to the parameter *attributes* is
 -- achieved by the first overloaded subprogram; the effect of assigning
 -- Attribute_designators to the parameter *attributes* is achieved by the second overloaded
 -- subprogram.

```
procedure get_several_attributes (
    origin      : in      Pcte.object_reference;
    link        : in      Pcte.link_reference;
    values      : in out Pcte.attribute_assignments.sequence;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure get_several_attributes (
    origin      : in      Pcte.object_reference;
    link        : in      Pcte.link_reference;
    attributes   : in      Pcte.attribute_references.sequence;
    values      : in out Pcte.attribute_assignments.sequence;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 9.2.9 LINK_REPLACE

```
procedure replace (
    origin          : in    Pcte.object_reference;
    link            : in    Pcte.link_reference;
    new_origin      : in    Pcte.object_reference;
    new_link        : in    Pcte.link_reference;
    new_reverse_key : in    Pcte.actual_key := "";
    status          : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 9.2.10 LINK_RESET_ATTRIBUTE

```
procedure reset_attribute (
    origin  : in    Pcte.object_reference;
    link    : in    Pcte.link_reference;
    attribute : in    Pcte.attribute_reference;
    status   : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 9.2.11 LINK_SET_ATTRIBUTE

-- LINK_SET_ATTRIBUTE is mapped to overloaded versions of the procedure
 -- Pcte_link.set_attribute, one for each possible type of the parameter value. If the type
 -- of the parameter value of the particular overloaded procedure that is used is different
 -- from the type of its parameter attribute, then the error VALUE_TYPE_IS_INVALID is
 -- raised.

```
procedure set_attribute (
    origin  : in    Pcte.object_reference;
    link    : in    Pcte.link_reference;
    attribute : in    Pcte.attribute_reference;
    value    : in    Pcte.boolean := FALSE;
    status   : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure set_attribute (
    origin  : in    Pcte.object_reference;
    link    : in    Pcte.link_reference;
    attribute : in    Pcte.attribute_reference;
    value    : in    Pcte.integer := 0;
    status   : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure set_attribute (
    origin  : in    Pcte.object_reference;
    link    : in    Pcte.link_reference;
    attribute : in    Pcte.attribute_reference;
    value    : in    Pcte.natural := 0;
    status   : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```

procedure set_attribute (
    origin      : in    Pcte.object_reference;
    link        : in    Pcte.link_reference;
    attribute    : in    Pcte.attribute_reference;
    value       : in    Pcte.float := 0.0;
    status      : in    Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure set_attribute (
    origin      : in    Pcte.object_reference;
    link        : in    Pcte.link_reference;
    attribute    : in    Pcte.attribute_reference;
    value       : in    Pcte.string := "";
    status      : in    Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure set_attribute (
    origin      : in    Pcte.object_reference;
    link        : in    Pcte.link_reference;
    attribute    : in    Pcte.attribute_reference;
    value       : in    Pcte.calendar.time := DEFAULT_TIME;
    status      : in    Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure set_attribute (
    origin      : in    Pcte.object_reference;
    link        : in    Pcte.link_reference;
    attribute    : in    Pcte.attribute_reference;
    value       : in    Pcte.enumeral_position;
    status      : in    Pcte_error.handle := EXCEPTION_ONLY);

```

-- 9.2.12 LINK_SET_SEVERAL_ATTRIBUTES

```

procedure set_several_attributes (
    origin      : in    Pcte.object_reference;
    link        : in    Pcte.link_reference;
    attributes   : in    Pcte.attribute_assignments.sequence;
    status      : in    Pcte_error.handle := EXCEPTION_ONLY);

```

-- 11.2.7 LINK_GET_DESTINATION_ARCHIVE

```

function get_destination_archive (
    origin      : Pcte.object_reference;
    link        : Pcte.link_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
    return      Pcte_archive.archive_identifier;

```

end Pcte_link;

9.3 Object operations

with Pcte, Pcte_error, Pcte_discretionary, Pcte_volume;

package Pcte_object **is**

```

use Pcte, Pcte.calendar, Pcte_error;

type type_ancestry is (EQUAL_TYPE, ANCESTOR_TYPE, DESCENDANT_TYPE,
    UNRELATED_TYPE);

-- Pcte_object.type_ancestry corresponds to the PCTE datatype Type_ancestry.
type link_scope is (INTERNAL_LINKS, EXTERNAL_LINKS, ALL_LINKS);

-- Pcte_object.link_scope corresponds to the PCTE datatype Link_scope.

type link_set_descriptor is record
    origin : Pcte.object_reference;
    links  : Pcte.link_references.sequence;
end record;

-- Pcte_object.link_set_descriptor corresponds to the PCTE datatype Link_set_descriptor.

-- The semantics of the operations of this package are defined in 8.2.8.

package link_set_descriptors is

    type sequence is limited private;

    -- Pcte_object.link_set_descriptor.sequence corresponds to the PCTE datatype
    -- Link_set_descriptors.

    function get (
        list      : Pcte_object.link_set_descriptors.sequence;
        index     : Pcte.natural := Pcte.natural'FIRST;
        status    : Pcte_error.handle := EXCEPTION_ONLY)
        return Pcte_object.link_set_descriptor;

    procedure insert (
        list      : in out Pcte_object.link_set_descriptors.sequence;
        item      : in Pcte_object.link_set_descriptor;
        index     : in Pcte.natural := Pcte.natural'LAST;
        status    : in Pcte_error.handle := EXCEPTION_ONLY);

    procedure replace (
        list      : in out Pcte_object.link_set_descriptors.sequence;
        item      : in Pcte_object.link_set_descriptor;
        index     : in Pcte.natural := Pcte.natural'LAST;
        status    : in Pcte_error.handle := EXCEPTION_ONLY);

    procedure append (
        list      : in out Pcte_object.link_set_descriptors.sequence;
        item      : in Pcte_object.link_set_descriptor;
        status    : in Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure delete (
  list      : in out  Pcte_object.link_set_descriptors.sequence;
  index     : in      Pcte.natural := Pcte.natural'FIRST;
  count     : in      Pcte.positive := Pcte.positive'LAST;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);

procedure copy (
  into_list  : in out  Pcte_object.link_set_descriptors.sequence;
  from_list  : in      Pcte_object.link_set_descriptors.sequence;
  into_index : in      Pcte.natural := Pcte.natural'LAST;
  from_index : in      Pcte.natural := Pcte.natural'FIRST;
  count      : in      Pcte.positive := Pcte.positive'LAST;
  status     : in      Pcte_error.handle := EXCEPTION_ONLY);

function length_of (
  list      : Pcte_object.link_set_descriptors.sequence;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.natural;

function index_of (
  list      : Pcte_object.link_set_descriptors.sequence;
  item      : Pcte_object.link_set_descriptor;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.integer;

function are_equal (
  first     : Pcte_object.link_set_descriptors.sequence;
  second    : Pcte_object.link_set_descriptors.sequence;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.boolean;

procedure normalize (
  list      : in out  Pcte_object.link_set_descriptors.sequence;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);

procedure discard (
  list      : in out  Pcte_object.link_set_descriptors.sequence;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);

private
  implementation-defined

end link_set_descriptors;

type time_kind is (CURRENT_SYSTEM_TIME, SPECIFIED_TIME);

```


type time_selection (kind : Pcte_object.time_kind := CURRENT_SYSTEM_TIME)
is record

case kind **is**

when CURRENT_SYSTEM_TIME => **null**;

when SPECIFIED_TIME => time : Pcte.calendar.time;

end case;

end record;

-- 9.3.1 OBJECT_CHECK_TYPE

function check_type (

 object : Pcte.object_reference;

 type2 : Pcte.type_reference;

 status : Pcte_error.handle := EXCEPTION_ONLY)

return Pcte_object.type_ancestry;

-- 9.3.2 OBJECT_CONVERT

procedure convert (

 object : **in** Pcte.object_reference;

 pcte_type : **in** Pcte.type_reference;

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 9.3.3 OBJECT_COPY

procedure copy (

 object : **in** Pcte.object_reference;

 new_origin : **in** Pcte.object_reference;

 new_link : **in** Pcte.link_reference;

 access_mask : **in** Pcte_discretionary.object.atomic_access_rights;

 new_object : **in out** Pcte.object_reference;

 reverse_key : **in** Pcte.actual_key := "";

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure copy (

 object : **in** Pcte.object_reference;

 new_origin : **in** Pcte.object_reference;

 new_link : **in** Pcte.link_reference;

 on_same_volume_as : **in** Pcte.object_reference;

 access_mask : **in** Pcte_discretionary.object.atomic_access_rights;

 new_object : **in out** Pcte.object_reference;

 reverse_key : **in** Pcte.actual_key := "";

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 9.3.4 OBJECT_CREATE

```

procedure create (
    pcte_type      : in      Pcte.type_reference;
    new_origin     : in      Pcte.object_reference;
    new_link       : in      Pcte.link_reference;
    access_mask    : in      Pcte_discretionary.object.atomic_access_rights;
    new_object     : in out  Pcte.object_reference;
    reverse_key    : in      Pcte.actual_key := "";
    status         : in      Pcte_error.handle := EXCEPTION_ONLY);

procedure create (
    pcte_type      : in      Pcte.type_reference;
    new_origin     : in      Pcte.object_reference;
    new_link       : in      Pcte.link_reference;
    on_same_volume_as : in      Pcte.object_reference;
    access_mask    : in      Pcte_discretionary.object.atomic_access_rights;
    new_object     : in out  Pcte.object_reference;
    reverse_key    : in      Pcte.actual_key := "";
    status         : in      Pcte_error.handle := EXCEPTION_ONLY);

```

-- 9.3.5 OBJECT_DELETE

```

procedure delete (
    origin : in      Pcte.object_reference;
    link   : in      Pcte.link_reference;
    status : in      Pcte_error.handle := EXCEPTION_ONLY);

```

-- 9.3.6 OBJECT_DELETE_ATTRIBUTE

```

procedure delete_attribute (
    object   : in      Pcte.object_reference;
    attribute : in      Pcte.attribute_reference;
    status   : in      Pcte_error.handle := EXCEPTION_ONLY);

```

-- 9.3.7 OBJECT_GET_ATTRIBUTE

-- OBJECT_GET_ATTRIBUTE is mapped to overloaded versions of the function
 -- Pcte_object.get_attribute, one for each possible type of the result. If the type of the
 -- result of the particular overloaded function that is used is different from the type of its
 -- parameter attribute, then the error VALUE_TYPE_IS_INVALID is raised.

```

function get_attribute (
    object   : Pcte.object_reference;
    attribute : Pcte.attribute_reference;
    status   : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.boolean;

```

```

function get_attribute (
    object      : Pcte.object_reference;
    attribute   : Pcte.attribute_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return       Pcte.natural;

```

```

function get_attribute (
    object      : Pcte.object_reference;
    attribute   : Pcte.attribute_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return       Pcte.integer;

```

```

function get_attribute (
    object      : Pcte.object_reference;
    attribute   : Pcte.attribute_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return       Pcte.float;

```

```

function get_attribute (
    object      : Pcte.object_reference;
    attribute   : Pcte.attribute_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return       Pcte.calendar.time;

```

```

function get_attribute (
    object      : Pcte.object_reference;
    attribute   : Pcte.attribute_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return       Pcte.string;

```

```

function get_attribute (
    object      : Pcte.object_reference;
    attribute   : Pcte.attribute_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return       Pcte.enumeral_position;

```

-- 9.3.8 OBJECT_GET_PREFERENCE

```

procedure get_preference (
    object      : in      Pcte.object_reference;
    key         : out     Pcte.text;
    key_length  : out     Pcte.string_length;
    pcte_type   : in out Pcte.type_reference;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);

```

- The *key_length* parameter gives the actual length of the value returned in the *key*
- parameter. The error STRING_IS_TOO_SHORT is returned when the parameter *key*
- is too short to hold the returned value.

-- 9.3.9 OBJECT_GET_SEVERAL_ATTRIBUTES

-- The effect of assigning `VISIBLE_ATTRIBUTE_TYPES` to the parameter *attributes*
 -- is achieved by the first overloaded subprogram; the effect of assigning
 -- `Attribute_type_nominators` to the parameter *attributes* is achieved by the second
 -- overloaded subprogram.

```
procedure get_several_attributes (
  object : in      Pcte.object_reference;
  values : in out  Pcte.attribute_assignments.sequence;
  status : in      Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure get_several_attributes (
  object      : in      Pcte.object_reference;
  attributes  : in      Pcte.attribute_references.sequence;
  values      : in out  Pcte.attribute_assignments.sequence;
  status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 9.3.10 OBJECT_GET_TYPE

```
function get_type (
  object      : Pcte.object_reference;
  status      : Pcte_error.handle := EXCEPTION_ONLY)
return       Pcte.type_reference;
```

-- 9.3.11 OBJECT_IS_COMPONENT

```
function is_component (
  object1     : Pcte.object_reference;
  object2     : Pcte.object_reference;
  status      : Pcte_error.handle := EXCEPTION_ONLY)
return       Pcte.boolean;
```

-- 9.3.12 OBJECT_LIST_LINKS

-- The effect of assigning `ALL_LINK_TYPES` to the parameter *visibility* is achieved by the
 -- subprogram `Pcte_object.list_all_links`. The effect of assigning `VISIBLE_LINK_TYPES`
 -- to the parameter *visibility* is achieved by the subprogram `Pcte_object.`
 -- `list_links_in_working_schema`. The effect of assigning `Link_type_nominators` to the
 -- parameter *visibility* is achieved by the subprogram `Pcte_object.list_links_of_types`.

```
procedure list_links_in_working_schema (
  origin      : in      Pcte.object_reference;
  extent      : in      Pcte_object.link_scope;
  scope       : in      Pcte.object_scope;
  categories  : in      Pcte.categories;
  links       : in out  Pcte_object.link_set_descriptors.sequence;
  status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

```

procedure list_links_of_types (
    origin      : in      Pcte.object_reference;
    extent      : in      Pcte_object.link_scope;
    scope       : in      Pcte.object_scope;
    categories  : in      Pcte.categories;
    link_types  : in      Pcte.type_references.sequence;
    links       : in out  Pcte_object.link_set_descriptors.sequence;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure list_all_links (
    origin      : in      Pcte.object_reference;
    extent      : in      Pcte_object.link_scope;
    scope       : in      Pcte.object_scope;
    categories  : in      Pcte.categories;
    links       : in out  Pcte_object.link_set_descriptors.sequence;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);

```

-- 9.3.13 OBJECT_LIST_VOLUMES

```

procedure list_volumes (
    object      : in      Pcte.object_reference;
    volumes     : in out  Pcte_volume.volume_infos.sequence;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);

```

-- 9.3.14 OBJECT_MOVE

```

procedure move (
    object              : in      Pcte.object_reference;
    on_same_volume_as  : in      Pcte.object_reference;
    scope              : in      Pcte.object_scope;
    status              : in      Pcte_error.handle := EXCEPTION_ONLY);

```

-- 9.3.15 OBJECT_RESET_ATTRIBUTE

```

procedure reset_attribute (
    object      : in      Pcte.object_reference;
    attribute   : in      Pcte.attribute_reference;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);

```

-- 9.3.16 OBJECT_SET_ATTRIBUTE

-- OBJECT_SET_ATTRIBUTE is mapped to overloaded versions of the procedure
 -- Pcte_object.set_attribute, one for each possible type of the parameter value. If the type
 -- of the parameter value of the particular overloaded procedure that is used is different
 -- from the type of its parameter attribute, then the error VALUE_TYPE_IS_INVALID is
 -- raised.

```

procedure set_attribute (
    object      : in      Pcte.object_reference;
    attribute   : in      Pcte.attribute_reference;
    value       : in      Pcte.boolean := FALSE;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure set_attribute (
  object      : in    Pcte.object_reference;
  attribute   : in    Pcte.attribute_reference;
  value       : in    Pcte.natural := 0;
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure set_attribute (
  object      : in    Pcte.object_reference;
  attribute   : in    Pcte.attribute_reference;
  value       : in    Pcte.integer := 0;
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure set_attribute (
  object      : in    Pcte.object_reference;
  attribute   : in    Pcte.attribute_reference;
  value       : in    Pcte.float := 0.0;
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure set_attribute (
  object      : in    Pcte.object_reference;
  attribute   : in    Pcte.attribute_reference;
  value       : in    Pcte.calendar.time := DEFAULT_TIME;
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure set_attribute (
  object      : in    Pcte.object_reference;
  attribute   : in    Pcte.attribute_reference;
  value       : in    Pcte.string := "";
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure set_attribute (
  object      : in    Pcte.object_reference;
  attribute   : in    Pcte.attribute_reference;
  value       : in    Pcte.enumeral_position;
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);

```

-- 9.3.17 OBJECT_SET_PREFERENCE

-- The effect of providing both the optional parameter *type* and the optional parameter *key* is obtained by the first subprogram. The effect of providing the optional parameter *type* and not providing the optional parameter *key* is obtained by the second subprogram. The effect of not providing the optional parameter *type* and providing the optional parameter *key* is obtained by the third subprogram. The effect of providing neither the optional parameter *type* nor the optional parameter *key* is obtained by the procedure `Pcte_object.unset_preference`.

```

procedure set_preference (
  object      : in    Pcte.object_reference;
  pcte_type   : in    Pcte.type_reference;
  key         : in    Pcte.text;
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure set_type_preference (
    object      : in    Pcte.object_reference;
    pcte_type   : in    Pcte.type_reference;
    status      : in    Pcte_error.handle := EXCEPTION_ONLY);

procedure set_key_preference (
    object : in    Pcte.object_reference;
    key    : in    Pcte.string;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);

procedure unset_preference (
    object : in    Pcte.object_reference;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 9.3.18 OBJECT_SET_SEVERAL_ATTRIBUTES

procedure set_several_attributes (
    object      : in    Pcte.object_reference;
    attributes  : in    Pcte.attribute_assignments.sequence;
    status      : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 9.3.19 OBJECT_SET_TIME_ATTRIBUTES

procedure set_time_attributes (
    object          : in    Pcte.object_reference;
    scope           : in    Pcte.object_scope;
    last_access     : in    Pcte_object.time_selection :=
                        (KIND => CURRENT_SYSTEM_TIME);
    last_modification : in    Pcte_object.time_selection :=
                        (KIND => CURRENT_SYSTEM_TIME);
    status          : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 9.3.20 VOLUME_LIST_OBJECTS

-- See 11.2.

end    Pcte_object;

9.4 Version operations

with Pcte, Pcte_error, Pcte_discretionary;

package Pcte_version is

    use Pcte, Pcte_error;

    type version_relation is (ANCESTOR_VSN, DESCENDANT_VSN, SAME_VSN,
        RELATED_VSN, UNRELATED_VSN);

    -- Pcte_version.version_relation corresponds to the PCTE datatype Version_relation.

```

-- 9.4.1 VERSION_ADD_PREDECESSOR

```
procedure add_predecessor (
    version      : in    Pcte.object_reference;
    new_predecessor : in    Pcte.object_reference;
    status       : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 9.4.2 VERSION_IS_CHANGED

```
function is_changed (
    version      : Pcte.object_reference;
    predecessor  : Pcte.actual_key;
    status       : Pcte_error.handle := EXCEPTION_ONLY)
return         Pcte.boolean;
```

-- 9.4.3 VERSION_REMOVE

```
procedure remove (
    version  : in    Pcte.object_reference;
    status   : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 9.4.4 VERSION_REMOVE_PREDECESSOR

```
procedure remove_predecessor (
    version      : in    Pcte.object_reference;
    predecessor  : in    Pcte.object_reference;
    status       : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 9.4.5 VERSION_REVISE

```
procedure revise (
    version      : in    Pcte.object_reference;
    new_origin   : in    Pcte.object_reference;
    new_link     : in    Pcte.link_reference;
    on_same_volume_as : in    Pcte.object_reference;
    access_mask  : in    Pcte_discretionary.object.atomic_access_rights;
    new_version  : in out Pcte.object_reference;
    status       : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure revise (
    version      : in    Pcte.object_reference;
    new_origin   : in    Pcte.object_reference;
    new_link     : in    Pcte.link_reference;
    access_mask  : in    Pcte_discretionary.object.atomic_access_rights;
    new_version  : in out Pcte.object_reference;
    status       : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 9.4.6 VERSION_SNAPSHOT

- The parameter *new_link_and_origin* is mapped as two parameters *new_origin* and
- *new_link* for consistency with *Pcte_version.revise*.


```

procedure snapshot (
  version      : in      Pcte.object_reference;
  new_origin   : in      Pcte.object_reference;
  new_link     : in      Pcte.link_reference;
  on_same_volume_as : in Pcte.object_reference;
  access_mask  : in      Pcte_discretionary.object.atomic_access_rights;
  new_version  : in out  Pcte.object_reference;
  status       : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure snapshot (
  version      : in      Pcte.object_reference;
  new_origin   : in      Pcte.object_reference;
  new_link     : in      Pcte.link_reference;
  access_mask  : in      Pcte_discretionary.object.atomic_access_rights;
  new_version  : in out  Pcte.object_reference;
  status       : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure snapshot (
  version      : in      Pcte.object_reference;
  on_same_volume_as : in Pcte.object_reference;
  access_mask  : in      Pcte_discretionary.object.atomic_access_rights;
  new_version  : in out  Pcte.object_reference;
  status       : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure snapshot (
  version      : in      Pcte.object_reference;
  access_mask  : in      Pcte_discretionary.object.atomic_access_rights;
  new_version  : in out  Pcte.object_reference;
  status       : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```
-- 9.4.7 VERSION_TEST_ANCESTRY
```

```

function test_ancestry (
  version1 : Pcte.object_reference;
  version2 : Pcte.object_reference;
  status   : Pcte_error.handle := EXCEPTION_ONLY)
return    Pcte_version.version_relation;

```

```
-- 9.4.8 VERSION_TEST_DESCENT
```

```

function test_descent (
  version1 : Pcte.object_reference;
  version2 : Pcte.object_reference;
  status   : Pcte_error.handle := EXCEPTION_ONLY)
return    Pcte_version.version_relation;

```

```
end Pcte_version;
```

10 Schema management

```
with Pcte, Pcte_error;
```

package Pcte_sds **is**

use Pcte, Pcte_error, Pcte.calendar, Pcte.reference;

10.1 Schema management datatypes

type duplication **is** (DUPLICATED, NON_DUPLICATED);

-- Pcte_sds.duplication corresponds to the PCTE datatype Duplication.

type exclusiveness **is** (SHARABLE, EXCLUSIVE);

-- Pcte_sds.exclusiveness corresponds to the PCTE datatype Exclusiveness.

type stability **is** (ATOMIC_STABLE, COMPOSITE_STABLE, NON_STABLE);

-- Pcte_sds.stability corresponds to the PCTE datatype Stability.

type contents_type **is** (NO_CONTENTS, FILE_TYPE, PIPE_TYPE, DEVICE_TYPE, AUDIT_FILE_TYPE, ACCOUNTING_LOG_TYPE);

-- Pcte_sds.contents_type corresponds to the PCTE datatype Contents_type. The value

-- NO_CONTENTS is used to indicate absence of a Contents_type value.

type link_type_properties **is record**

category : Pcte.category;

lower_bound : Pcte.natural;

upper_bound : Pcte.natural;

exclusiveness : Pcte_sds.exclusiveness;

stability : Pcte_sds.stability;

duplication : Pcte_sds.duplication;

key_types : Pcte.type_names_in_sds.sequence;

end record;

-- Pcte_sds.link_type_properties corresponds to the PCTE datatypes of certain parameters

-- of SDS_CREATE_RELATIONSHIP_TYPE and SDS_GET_LINK_TYPE_

-- PROPERTIES, which are mapped to a single parameter.

type attribute_type_properties (

type_is : Pcte.value_type := INTEGER_TYPE;

string_length : Pcte.string_length := 0)

is record

duplication : Pcte_sds.duplication;

value : Pcte.attribute_value(type_is, string_length);

enumerals : Pcte.type_names_in_sds.sequence

end record;

-- Pcte_sds.attribute_type_properties corresponds to the PCTE datatypes of the results of

-- SDS_GET_ATTRIBUTE_TYPE_PROPERTIES.

type object_type_properties **is record**

contents_type : Pcte_sds.contents_type;

parents : Pcte.type_names_in_sds.sequence;

children : Pcte.type_names_in_sds.sequence;

end record;

-- Pcte_sds.object_type_properties corresponds to the PCTE datatypes of the results of
 -- SDS_GET_OBJECT_TYPE_PROPERTIES.

type definition_mode_value **is** (CREATE, DELETE, READ, WRITE, NAVIGATE);

type definition_mode_values **is array** (definition_mode_value) **of** Pcte.boolean;

-- Pcte_sds.definition_mode_values corresponds to the PCTE datatype
 -- Definition_mode_values.

type attribute_scan_kind **is** (OBJECT, OBJECT_ALL, LINK_KEY, LINK_NON_KEY);

-- Pcte_sds.attribute_scan_kind corresponds to the PCTE datatype Attribute_scan_kind.

type link_scan_kind **is** (ORIGIN, ORIGIN_ALL, DESTINATION, DESTINATION_ALL,
 KEY, NON_KEY);

-- Pcte_sds.link_scan_kind corresponds to the PCTE datatype Link_scan_kind.

type object_scan_kind **is** (CHILD, DESCENDANT, PARENT, ANCESTOR,
 ATTRIBUTE, ATTRIBUTE_ALL, LINK_ORIGIN, LINK_ORIGIN_ALL,
 LINK_DESTINATION, LINK_DESTINATION_ALL);

-- Pcte_sds.object_scan_kind corresponds to the PCTE datatype Object_scan_kind.

type type_kind **is** (OBJECT_TYPE, LINK_TYPE, ATTRIBUTE_TYPE,
 ENUMERAL_TYPE);

-- Pcte_sds.type_kind corresponds to the PCTE datatype Type_kind.

10.2 Update operations

-- 10.2.1 SDS_ADD_DESTINATION

procedure add_destination (

sds : **in** Pcte.object_reference;
 link_type : **in** Pcte.type_name_in_sds;
 object_type : **in** Pcte.type_name_in_sds;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 10.2.2 SDS_APPLY_ATTRIBUTE_TYPE

procedure apply_attribute_type (

sds : **in** Pcte.object_reference;
 attribute_type : **in** Pcte.type_name_in_sds;
 pcte_type : **in** Pcte.type_name_in_sds;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 10.2.3 SDS_APPLY_LINK_TYPE

procedure apply_link_type (

sds : **in** Pcte.object_reference;
 link_type : **in** Pcte.type_name_in_sds;
 object_type : **in** Pcte.type_name_in_sds;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 10.2.4 SDS_CREATE_BOOLEAN_ATTRIBUTE_TYPE

```
procedure create_boolean_attribute_type (
  sds           : in      Pcte.object_reference;
  duplication    : in      Pcte_sds.duplication;
  new_type      : in out  Pcte.type_name_in_sds;
  new_type_length : out    Pcte.natural;
  local_name    : in      Pcte.name := "";
  initial_value  : in      Pcte.boolean := FALSE;
  status        : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.5 SDS_CREATE_DESIGNATION_LINK_TYPE

```
procedure create_designation_link_type (
  sds           : in      Pcte.object_reference;
  lower_bound   : in      Pcte.natural;
  upper_bound   : in      Pcte.natural;
  duplication    : in      Pcte_sds.duplication;
  key_types     : in      Pcte.type_names_in_sds.sequence;
  new_type      : in out  Pcte.type_name_in_sds;
  new_type_length : out    Pcte.natural;
  local_name    : in      Pcte.name := "";
  status        : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.6 SDS_CREATE_ENUMERAL_TYPE

```
procedure create_enumeral_type (
  sds           : in      Pcte.object_reference;
  new_type      : in out  Pcte.type_name_in_sds;
  new_type_length : out    Pcte.natural;
  local_name    : in      Pcte.name := "";
  status        : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.7 SDS_CREATE_ENUMERATION_ATTRIBUTE_TYPE

```
procedure create_enumeration_attribute_type (
  sds           : in      Pcte.object_reference;
  duplication    : in      Pcte_sds.duplication;
  values        : in      Pcte.type_names_in_sds.sequence;
  new_type      : in out  Pcte.type_name_in_sds;
  new_type_length : out    Pcte.natural;
  local_name    : in      Pcte.name := "";
  initial_value  : in      Pcte.natural := 0;
  status        : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.8 SDS_CREATE_FLOAT_ATTRIBUTE_TYPE

```
procedure create_float_attribute_type (
  sds           : in      Pcte.object_reference;
  duplication    : in      Pcte_sds.duplication;
  new_type       : in out  Pcte.type_name_in_sds;
  new_type_length : out    Pcte.natural;
  local_name     : in      Pcte.name := "";
  initial_value  : in      Pcte.float := 0.0;
  status         : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.9 SDS_CREATE_INTEGER_ATTRIBUTE_TYPE

```
procedure create_integer_attribute_type (
  sds           : in      Pcte.object_reference;
  duplication    : in      Pcte_sds.duplication;
  new_type       : in out  Pcte.type_name_in_sds;
  new_type_length : out    Pcte.natural;
  local_name     : in      Pcte.name := "";
  initial_value  : in      Pcte.integer := 0;
  status         : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.10 SDS_CREATE_NATURAL_ATTRIBUTE_TYPE

```
procedure create_natural_attribute_type (
  sds           : in      Pcte.object_reference;
  duplication    : in      Pcte_sds.duplication;
  new_type       : in out  Pcte.type_name_in_sds;
  new_type_length : out    Pcte.natural;
  local_name     : in      Pcte.name := "";
  initial_value  : in      Pcte.natural := 0;
  status         : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.11 SDS_CREATE_OBJECT_TYPE

```
procedure create_object_type (
  sds           : in      Pcte.object_reference;
  parents       : in      Pcte.type_names_in_sds.sequence;
  new_type      : in out  Pcte.type_name_in_sds;
  new_type_length : out    Pcte.natural;
  local_name     : in      Pcte.name := "";
  status        : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.12 SDS_CREATE_RELATIONSHIP_TYPE

```

procedure create_relationship_type (
    sds                : in      Pcte.object_reference;
    forward_properties : in      Pcte_sds.link_type_properties;
    reverse_properties : in      Pcte_sds.link_type_properties;
    new_forward_type   : in out  Pcte.type_name_in_sds;
    new_reverse_type    : in out  Pcte.type_name_in_sds;
    new_forward_type_length : out  Pcte.natural;
    new_reverse_type_length : out  Pcte.natural;
    forward_local_name  : in      Pcte.name := "";
    reverse_local_name  : in      Pcte.name := "";
    status              : in      Pcte_error.handle := EXCEPTION_ONLY);

```

-- 10.2.13 SDS_CREATE_STRING_ATTRIBUTE_TYPE

```

procedure create_string_attribute_type (
    sds                : in      Pcte.object_reference;
    duplication         : in      Pcte_sds.duplication;
    new_type            : in out  Pcte.type_name_in_sds;
    new_type_length    : out      Pcte.natural;
    local_name          : in      Pcte.name := "";
    initial_value       : in      Pcte.string := "";
    status              : in      Pcte_error.handle := EXCEPTION_ONLY);

```

-- 10.2.14 SDS_CREATE_TIME_ATTRIBUTE_TYPE

```

procedure create_time_attribute_type (
    sds                : in      Pcte.object_reference;
    duplication         : in      Pcte_sds.duplication;
    new_type            : in out  Pcte.type_name_in_sds;
    new_type_length    : out      Pcte.natural;
    local_name          : in      Pcte.name := "";
    initial_value       : in      Pcte.calendar.time := DEFAULT_TIME;
    status              : in      Pcte_error.handle := EXCEPTION_ONLY);

```

-- 10.2.15 SDS_GET_NAME

```

function get_name (
    sds                : Pcte.object_reference;
    status              : Pcte_error.handle := EXCEPTION_ONLY)
    return              Pcte.name;

```

-- 10.2.16 SDS_IMPORT_ATTRIBUTE_TYPE

```

procedure import_attribute_type (
    to_sds              : in      Pcte.object_reference;
    from_sds            : in      Pcte.object_reference;
    pcte_type           : in      Pcte.type_name_in_sds;
    local_name          : in      Pcte.name := "";
    status              : in      Pcte_error.handle := EXCEPTION_ONLY);

```

-- 10.2.17 SDS_IMPORT_ENUMERAL_TYPE

```
procedure import_enumeral_type (
  to_sds      : in    Pcte.object_reference;
  from_sds    : in    Pcte.object_reference;
  pcte_type   : in    Pcte.type_name_in_sds;
  local_name  : in    Pcte.name := "";
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.18 SDS_IMPORT_LINK_TYPE

```
procedure import_link_type (
  to_sds      : in    Pcte.object_reference;
  from_sds    : in    Pcte.object_reference;
  pcte_type   : in    Pcte.type_name_in_sds;
  local_name  : in    Pcte.name := "";
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.19 SDS_IMPORT_OBJECT_TYPE

```
procedure import_object_type (
  to_sds      : in    Pcte.object_reference;
  from_sds    : in    Pcte.object_reference;
  pcte_type   : in    Pcte.type_name_in_sds;
  local_name  : in    Pcte.name := "";
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.20 SDS_INITIALIZE

```
procedure initialize (
  sds      : in    Pcte.object_reference;
  name     : in    Pcte.name;
  status   : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.21 SDS_REMOVE

```
procedure remove (
  sds      : in    Pcte.object_reference;
  status   : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.22 SDS_REMOVE_DESTINATION

```
procedure remove_destination (
  sds      : in    Pcte.object_reference;
  link_type : in    Pcte.type_name_in_sds;
  object_type : in    Pcte.type_name_in_sds;
  status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.23 SDS_REMOVE_TYPE

```
procedure remove_type (
    sds      : in    Pcte.object_reference;
    pcte_type : in    Pcte.type_name_in_sds;
    status   : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.24 SDS_SET_ENUMERAL_TYPE_IMAGE

```
procedure set_enumeral_type_image (
    sds      : in    Pcte.object_reference;
    pcte_type : in    Pcte.type_name_in_sds;
    image    : in    Pcte.text := "";
    status   : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.25 SDS_SET_TYPE_MODES

-- The effect of providing the optional parameter *usage_mode* but not the optional parameter
 -- *export_mode* is obtained by the subprogram Pcte_sds.set_usage_modes. The effect of
 -- providing *export_mode* but not *usage_mode* is obtained by the subprogram
 -- Pcte_sds.set_export_modes. The effect of providing both *usage_mode* and *export_mode*
 -- is obtained by the subprogram Pcte_sds.set_type_modes. The effect of providing neither
 -- *usage_mode* nor *export_mode* is null and so no corresponding subprogram is required.

```
procedure set_usage_modes (
    sds      : in    Pcte.object_reference;
    pcte_type : in    Pcte.type_name_in_sds;
    usage_mode : in    Pcte_sds.definition_mode_values;
    status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure set_export_modes (
    sds      : in    Pcte.object_reference;
    pcte_type : in    Pcte.type_name_in_sds;
    export_mode : in    Pcte_sds.definition_mode_values;
    status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure set_type_modes (
    sds      : in    Pcte.object_reference;
    pcte_type : in    Pcte.type_name_in_sds;
    usage_mode : in    Pcte_sds.definition_mode_values;
    export_mode : in    Pcte_sds.definition_mode_values;
    status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.26 SDS_SET_TYPE_NAME

```
procedure set_type_name (
    sds      : in    Pcte.object_reference;
    pcte_type : in    Pcte.type_name_in_sds;
    local_name : in    Pcte.name := "";
    status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```


-- 10.2.27 SDS_UNAPPLY_ATTRIBUTE_TYPE

```
procedure unapply_attribute_type (
  sds          : in    Pcte.object_reference;
  attribute_type : in    Pcte.type_name_in_sds;
  pcte_type     : in    Pcte.type_name_in_sds;
  status        : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.2.28 SDS_UNAPPLY_LINK_TYPE

```
procedure unapply_link_type (
  sds          : in    Pcte.object_reference;
  link_type     : in    Pcte.type_name_in_sds;
  object_type   : in    Pcte.type_name_in_sds;
  status        : in    Pcte_error.handle := EXCEPTION_ONLY);
```

10.3 Usage operations

-- 10.3.1 SDS_GET_ATTRIBUTE_TYPE_PROPERTIES

-- If the abstract operation returns an enumeration value type in *value_type* then
 -- *properties.type_is* is set to ENUMERAL_TYPE and *properties.enumeral_types*
 -- contains the sequence of enumerals type nominators.

```
procedure get_attribute_type_properties (
  sds          : in    Pcte.object_reference;
  pcte_type    : in    Pcte.type_name_in_sds;
  properties   : out   Pcte_sds.attribute_type_properties;
  status       : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.3.2 SDS_GET_ENUMERAL_TYPE_IMAGE

```
function get_enumeral_type_image (
  sds          : Pcte.object_reference;
  pcte_type    : Pcte.type_name_in_sds;
  status       : Pcte_error.handle := EXCEPTION_ONLY)
return        Pcte.text;
```

-- 10.3.3 SDS_GET_ENUMERAL_TYPE_POSITION

```
function get_enumeral_type_position (
  sds          : Pcte.object_reference;
  type1        : Pcte.type_name_in_sds;
  type2        : Pcte.type_name_in_sds;
  status       : Pcte_error.handle := EXCEPTION_ONLY)
return        Pcte.natural;
```

-- 10.3.4 SDS_GET_LINK_TYPE_PROPERTIES

```
procedure get_link_type_properties (
  sds           : in      Pcte.object_reference;
  pcte_type     : in      Pcte.type_name_in_sds;
  properties    : in out  Pcte_sds.link_type_properties;
  pcte_reverse  : in out  Pcte.type_name_in_sds;
  reverse_type_length : out Pcte.natural;
  status        : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.3.5 SDS_GET_OBJECT_TYPE_PROPERTIES

```
procedure get_object_type_properties (
  sds      : in      Pcte.object_reference;
  pcte_type : in      Pcte.type_name_in_sds;
  properties : in out Pcte_sds.object_type_properties;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.3.6 SDS_GET_TYPE_KIND

```
function get_type_kind (
  sds      : Pcte.object_reference;
  pcte_type : Pcte.type_name_in_sds;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte_sds.type_kind;
```

-- 10.3.7 SDS_GET_TYPE_MODES

```
procedure get_type_modes (
  sds           : in      Pcte.object_reference;
  pcte_type     : in      Pcte.type_name_in_sds;
  usage_mode    : out     Pcte_sds.definition_mode_values;
  export_mode   : out     Pcte_sds.definition_mode_values;
  max_usage_mode : out     Pcte_sds.definition_mode_values;
  status        : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.3.8 SDS_GET_TYPE_NAME

```
function get_type_name (
  sds      : Pcte.object_reference;
  pcte_type : Pcte.type_name_in_sds;
  status    : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte.name;
```

-- 10.3.9 SDS_SCAN_ATTRIBUTE_TYPE

```
procedure scan_attribute_type (
  sds           : in      Pcte.object_reference;
  pcte_type     : in      Pcte.type_name_in_sds;
  scanning_kind : in      Pcte_sds.attribute_scan_kind;
  types         : in out  Pcte.type_references.sequence;
  status        : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.3.10 SDS_SCAN_ENUMERAL_TYPE

```
procedure scan_enumeral_type (
  sds      : in      Pcte.object_reference;
  pcte_type : in      Pcte.type_name_in_sds;
  types    : in out  Pcte.type_references.sequence;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.3.11 SDS_SCAN_LINK_TYPE

```
procedure scan_link_type (
  sds      : in      Pcte.object_reference;
  pcte_type : in      Pcte.type_name_in_sds;
  scanning_kind : in  Pcte_sds.link_scan_kind;
  types    : in out  Pcte.type_references.sequence;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.3.12 SDS_SCAN_OBJECT_TYPE

```
procedure scan_object_type (
  sds      : in      Pcte.object_reference;
  pcte_type : in      Pcte.type_name_in_sds;
  scanning_kind : in  Pcte_sds.object_scan_kind;
  types    : in out  Pcte.type_references.sequence;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.3.13 SDS_SCAN_TYPES

```
procedure scan_types (
  sds  : in      Pcte.object_reference;
  kind : in      Pcte_sds.type_kind;
  types : in out Pcte.type_references.sequence;
  status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure scan_types (
  sds  : in      Pcte.object_reference;
  types : in out Pcte.type_references.sequence;
  status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

10.4 Working schema operations

-- 10.4.1 WS_GET_ATTRIBUTE_TYPE_PROPERTIES

```
procedure get_attribute_type_properties (
  pcte_type : in      Pcte.type_reference;
  properties : out    Pcte_sds.attribute_type_properties;
  status     : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.4.2 WS_GET_ENUMERAL_TYPE_IMAGE

```
function get_enumeral_type_image (
    pcte_type : Pcte.type_reference;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.text;
```

-- 10.4.3 WS_GET_ENUMERAL_TYPE_POSITION

```
function get_enumeral_type_position (
    type1      : Pcte.type_reference;
    type2      : Pcte.type_reference;
    status     : Pcte_error.handle := EXCEPTION_ONLY)
return       Pcte.natural;
```

-- 10.4.4 WS_GET_LINK_TYPE_PROPERTIES

```
procedure get_link_type_properties (
    pcte_type   : in      Pcte.type_reference;
    properties  : in out Pcte_sds.link_type_properties;
    pcte_reverse : in out Pcte.type_reference;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.4.6 WS_GET_OBJECT_TYPE_PROPERTIES

```
procedure get_object_type_properties (
    pcte_type : in      Pcte.type_reference;
    properties : in out Pcte_sds.object_type_properties;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.4.7 WS_GET_TYPE_KIND

```
function get_type_kind (
    pcte_type : Pcte.type_reference;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte_sds.type_kind;
```

-- 10.4.8 WS_GET_TYPE_MODES

```
function get_type_modes (
    pcte_type : Pcte.type_reference;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte_sds.definition_mode_values;
```

-- 10.4.9 WS_GET_TYPE_NAME

```
function get_type_name (
    pcte_type : Pcte.type_reference;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.name;
```

-- 10.4.10 WS_SCAN_ATTRIBUTE_TYPE

```
procedure scan_attribute_type (
  pcte_type      : in      Pcte.type_reference;
  scanning_kind  : in      Pcte_sds.attribute_scan_kind;
  types          : in out  Pcte.type_references.sequence;
  status         : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.4.11 WS_SCAN_ENUMERAL_TYPE

```
procedure scan_enumeral_type (
  pcte_type : in      Pcte.type_reference;
  types     : in out  Pcte.type_references.sequence;
  status    : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.4.12 WS_SCAN_LINK_TYPE

```
procedure scan_link_type (
  pcte_type      : in      Pcte.type_reference;
  scanning_kind  : in      Pcte_sds.link_scan_kind;
  types          : in out  Pcte.type_references.sequence;
  status         : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.4.13 WS_SCAN_OBJECT_TYPE

```
procedure scan_object_type (
  pcte_type      : in      Pcte.type_reference;
  scanning_kind  : in      Pcte_sds.object_scan_kind;
  types          : in out  Pcte.type_references.sequence;
  status         : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 10.4.14 WS_SCAN_TYPES

```
procedure scan_types (
  kind  : in      Pcte_sds.type_kind;
  types : in out  Pcte.type_references.sequence;
  status : in      Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure scan_types (
  types : in out  Pcte.type_references.sequence;
  status : in      Pcte_error.handle := EXCEPTION_ONLY);
```

end Pcte_sds;

11 Volumes, devices, and archives

11.1 Volume, device, and archive datatypes

-- See the beginning of the packages Pcte_archive, Pcte_device, and Pcte_volume.

11.2 Volume, device, and archive operations

with Pcte, Pcte_error, Pcte_discretionary;

package Pcte_archive **is**

use Pcte, Pcte_error;

type archive_identifier **is new** Pcte.natural;

-- Pcte_archive.archive_identifier corresponds to the PCTE datatype Archive_identifier.

type archive_status **is** (PARTIAL, COMPLETE);

-- Pcte_archive.archive_status corresponds to the PCTE datatype Archive_status.

-- 11.2.1 ARCHIVE_CREATE

procedure create (

archive_identifier : **in** Pcte.natural;

on_same_volume_as : **in** Pcte.object_reference;

access_mask : **in** Pcte_discretionary.object.atomic_access_rights;

new_archive : **in out** Pcte.object_reference;

status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 11.2.2 ARCHIVE_REMOVE

procedure remove (

archive : **in** Pcte.object_reference;

status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 11.2.3 ARCHIVE_RESTORE

-- ARCHIVE_RESTORE is mapped to two overloaded procedures Pcte_archive.restore
-- according to whether the value of the parameter scope is Object_designators (first
-- procedure) or ALL (second procedure).

procedure restore (

device : **in** Pcte.object_reference;

archive : **in** Pcte.object_reference;

objects : **in** Pcte.object_references.sequence;

on_same_volume_as : **in** Pcte.object_reference;

restoring_status : **out** Pcte_archive.archive_status;

status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure restore (

device : **in** Pcte.object_reference;

archive : **in** Pcte.object_reference;

on_same_volume_as : **in** Pcte.object_reference;

restoring_status : **out** Pcte_archive.archive_status;

status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 11.2.4 ARCHIVE_SAVE

```
procedure save (
    device           : in    Pcte.object_reference;
    archive          : in    Pcte.object_reference;
    objects          : in    Pcte.object_references.sequence;
    archiving_status : out   Pcte_archive.archive_status;
    status           : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end Pcte_archive;

with Pcte, Pcte_error, Pcte_contents, Pcte_discretionary;

package Pcte_device **is**

use Pcte, Pcte_error;

type device_identifier **is new** Pcte.natural;

-- Pcte_device.device_identifier corresponds to the PCTE datatype Device_identifier.

-- 11.2.5 DEVICE_CREATE

```
procedure create (
    station           : in    Pcte.object_reference;
    device_type       : in    Pcte.type_reference;
    access_mask       : in    Pcte_discretionary.object.atomic_access_rights;
    device_identifier : in    Pcte.natural;
    device_characteristics : in Pcte.string;
    new_device        : in out Pcte.object_reference;
    status            : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 11.2.6 DEVICE_REMOVE

```
procedure remove (
    device : in    Pcte.object_reference;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 11.2.7 LINK_GET_DESTINATION_ARCHIVE

-- See 9.2.

-- 12.2.13 DEVICE_GET_CONTROL

generic

type element_type **is private**;

function get_control (

contents : Pcte_contents.contents_handle;

operation : Pcte.natural;

status : Pcte_error.handle := EXCEPTION_ONLY)

return element_type;

```

-- 12.2.14 DEVICE_SET_CONTROL

generic
  type element_type is private;
procedure set_control (
  contents      : in    Pcte_contents.contents_handle;
  operation      : in    Pcte.natural;
  control_data   : in    element_type;
  status         : in    Pcte_error.handle := EXCEPTION_ONLY);
end Pcte_device;

with Pcte, Pcte_error, Pcte_discretionary;
package Pcte_volume is
  use Pcte, Pcte_error;
  type volume_accessibility is (ACCESSIBLE, INACCESSIBLE, UNKNOWN);
  -- Pcte_volume.volume_accessibility corresponds to the PCTE datatype
  -- Volume_accessibility.
  type volume_identifier is new Pcte.natural;
  -- Pcte_volume.volume_identifier corresponds to the PCTE datatype Volume_identifier.
  type volume_info is record
    identity      : Pcte_volume.volume_identifier;
    mounted       : Pcte_volume.volume_accessibility;
  end record;
  -- Pcte_volume.volume_info corresponds to the PCTE datatype Volume_info.
  type volume_status is record
    total_blocks  : Pcte.natural;
    free_blocks   : Pcte.natural;
    block_size    : Pcte.natural;
    num_objects   : Pcte.natural;
    volume_identifier : Pcte_volume.volume_identifier;
  end record;
  -- Pcte_volume.volume_status corresponds to the PCTE datatype Volume_status.

  -- The semantics of the operations of this package are defined in 8.2.8.
package volume_infos is
  type sequence is limited private;
  -- Pcte_volume.volume_infos.sequence corresponds to the PCTE datatype
  -- Volume_infos.

```



```

function get (
    list      : Pcte_volume.volume_infos.sequence;
    index     : Pcte.natural := Pcte.natural'FIRST;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return    Pcte_volume.volume_info;

procedure insert (
    list      : in out Pcte_volume.volume_infos.sequence;
    item      : in     Pcte_volume.volume_info;
    index     : in     Pcte.natural := Pcte.natural'LAST;
    status    : in     Pcte_error.handle := EXCEPTION_ONLY);

procedure replace (
    list      : in out Pcte_volume.volume_infos.sequence;
    item      : in     Pcte_volume.volume_info;
    index     : in     Pcte.natural := Pcte.natural'LAST;
    status    : in     Pcte_error.handle := EXCEPTION_ONLY);

procedure append (
    list      : in out Pcte_volume.volume_infos.sequence;
    item      : in     Pcte_volume.volume_info;
    status    : in     Pcte_error.handle := EXCEPTION_ONLY);

procedure delete (
    list      : in out Pcte_volume.volume_infos.sequence;
    index     : in     Pcte.natural := Pcte.natural'FIRST;
    count     : in     Pcte.positive := Pcte.positive'LAST;
    status    : in     Pcte_error.handle := EXCEPTION_ONLY);

procedure copy (
    into_list  : in out Pcte_volume.volume_infos.sequence;
    from_list  : in     Pcte_volume.volume_infos.sequence;
    into_index : in     Pcte.natural := Pcte.natural'LAST;
    from_index : in     Pcte.natural := Pcte.natural'FIRST;
    count      : in     Pcte.positive := Pcte.positive'LAST;
    status     : in     Pcte_error.handle := EXCEPTION_ONLY);

function length_of (
    list      : Pcte_volume.volume_infos.sequence;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return    Pcte.natural;

function index_of (
    list      : Pcte_volume.volume_infos.sequence;
    item      : Pcte_volume.volume_info;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return    Pcte.integer;

```

```

function are_equal (
    first      : Pcte_volume.volume_infos.sequence;
    second     : Pcte_volume.volume_infos.sequence;
    status     : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.boolean;

```

```

procedure normalize (
    list      : in out Pcte_volume.volume_infos.sequence;
    status    : in     Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure discard (
    list      : in out Pcte_volume.volume_infos.sequence;
    status    : in     Pcte_error.handle := EXCEPTION_ONLY);

```

private

implementation-defined

end volume_infos;

-- 11.2.8 VOLUME_CREATE

```

procedure create (
    device           : in     Pcte.object_reference;
    volume_identifier : in     Pcte.natural;
    access_mask      : in     Pcte_discretionary.object.atomic_access_rights;
    volume_characteristics : in Pcte.string;
    new_volume       : in out Pcte.object_reference;
    status           : in     Pcte_error.handle := EXCEPTION_ONLY);

```

-- 11.2.9 VOLUME_DELETE

```

procedure delete (
    volume : in Pcte.object_reference;
    status : in Pcte_error.handle := EXCEPTION_ONLY);

```

-- 11.2.10 VOLUME_GET_STATUS

```

function get_status (
    volume : Pcte.object_reference;
    status : Pcte_error.handle := EXCEPTION_ONLY)
    return   Pcte_volume.volume_status;

```

-- 11.2.11 VOLUME_MOUNT

```

procedure mount (
    device           : in     Pcte.object_reference;
    volume_identifier : in     Pcte_volume.volume_identifier;
    read_only        : in     Pcte.boolean;
    status           : in     Pcte_error.handle := EXCEPTION_ONLY);

```

```

-- 11.2.12 VOLUME_UNMOUNT

procedure unmount (
    volume    : in    Pcte.object_reference;
    status    : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 9.3.20 VOLUME_LIST_OBJECTS

procedure list_objects (
    volume    : in    Pcte.object_reference;
    types     : in    Pcte.type_references.sequence;
    objects   : in out Pcte.object_references.sequence;
    status    : in    Pcte_error.handle:= EXCEPTION_ONLY);

end Pcte_volume;

with Pcte, Pcte_error, Pcte_discretionary;
package Pcte_cluster is
    use Pcte, Pcte_error;

-- 11.3.1 CLUSTER_CREATE

procedure create (
    on_same_volume_as : in    Pcte.object_reference;
    cluster_identifier : in    Pcte.natural;
    access_mask        : in    Pcte_discretionary.object.atomic_access_rights;
    cluster_characteristics : in    Pcte.string;
    new_cluster        : in out Pcte.object_reference;
    status             : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 11.3.2 CLUSTER_DELETE

procedure delete (
    cluster : in    Pcte.object_reference;
    status  : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 11.3.3 CLUSTER_LIST_OBJECTS

procedure list_objects (
    cluster : in    Pcte.object_reference;
    types   : in    Pcte.type_references.sequence;
    objects : in out Pcte.object_references.sequence;
    status  : in    Pcte_error.handle := EXCEPTION_ONLY);

end Pcte_cluster;

```

12 Files, pipes, and devices

with Pcte, Pcte_error;

package Pcte_contents **is**

use Pcte, Pcte_error;

12.1 File, pipe, and device datatypes

type contents_access_mode **is** (READ_WRITE, READ_ONLY, WRITE_ONLY, APPEND_ONLY);

-- Pcte_contents.contents_access_mode corresponds to the PCTE datatype Contents_access_mode.

type seek_position **is** (FROM_BEGINNING, FROM_CURRENT, FROM_END);

-- Pcte_contents.seek_position corresponds to the PCTE datatype Seek_position.

type pcte_set_position **is** (AT_BEGINNING, AT_POSITION, AT_END);

-- Pcte_contents.pcte_set_position corresponds to the PCTE datatype Set_position.

type positioning_style **is** (SEQUENTIAL, DIRECT, SEEK);

-- Pcte_contents.positioning_style corresponds to the PCTE datatype Positioning_style.

type position_handle **is limited private**;

-- Pcte_contents.position_handle corresponds to the PCTE datatype Position_handle.

type contents_handle **is limited private**;

-- Pcte_contents.contents_handle corresponds to the PCTE datatype Contents_handle.

12.2 File, pipe, and device operations

-- The operations which return values of type Contents_handle can give rise to the binding-defined error condition CONTENTS_HANDLE_IS_OPEN(contents).

-- 12.2.1 CONTENTS_CLOSE

procedure close (

contents : **in** Pcte_contents.contents_handle;

status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 12.2.2 CONTENTS_GET_HANDLE_FROM_KEY

procedure get_handle_from_key (

open_object_key : **in** Pcte.natural;

contents : **in out** Pcte_contents.contents_handle;

status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 12.2.3 CONTENTS_GET_KEY_FROM_HANDLE

function get_key_from_handle (

contents : Pcte_contents.contents_handle;

status : Pcte_error.handle := EXCEPTION_ONLY)

return Pcte.natural;

-- 12.2.4 CONTENTS_GET_POSITION

```
procedure get_position (
  contents  : in    Pcte_contents.contents_handle;
  position  : out   Pcte_contents.position_handle;
  status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 12.2.5 CONTENTS_HANDLE_DUPLICATE

```
procedure handle_duplicate (
  contents      : in      Pcte_contents.contents_handle;
  new_key       : in      Pcte.natural;
  inheritable   : in      Pcte.boolean;
  new_contents  : in out  Pcte_contents.contents_handle;
  status        : in      Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure handle_duplicate (
  contents      : in      Pcte_contents.contents_handle;
  inheritable   : in      Pcte.boolean;
  new_contents  : in out  Pcte_contents.contents_handle;
  status        : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 12.2.6 CONTENTS_OPEN

```
procedure open (
  object        : in      Pcte.object_reference;
  opening_mode  : in      Pcte_contents.contents_access_mode;
  non_blocking_io : in    Pcte.boolean;
  inheritable   : in      Pcte.boolean;
  contents      : in out  Pcte_contents.contents_handle;
  status        : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 12.2.7 CONTENTS_READ

```
function read (
  contents : Pcte_contents.contents_handle;
  size     : Pcte.natural;
  status   : Pcte_error.handle := EXCEPTION_ONLY)
return    Pcte.string;
```

-- 12.2.8 CONTENTS_SEEK

```
procedure seek (
  contents      : in    Pcte_contents.contents_handle;
  offset        : in    Pcte.integer;
  whence        : in    Pcte_contents.seek_position;
  new_position  : out   Pcte.natural;
  status        : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 12.2.9 CONTENTS_SET_POSITION

```
procedure set_position (
    contents      : in    Pcte_contents.contents_handle;
    position_handle : in    Pcte_contents.position_handle;
    set_mode       : in    Pcte_contents.pcte_set_position;
    status         : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 12.2.10 CONTENTS_SET_PROPERTIES

```
procedure set_properties (
    contents      : in    Pcte_contents.contents_handle;
    positioning    : in    Pcte_contents.positioning_style;
    status        : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 12.2.11 CONTENTS_TRUNCATE

```
procedure truncate (
    contents : in    Pcte_contents.contents_handle;
    status   : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 12.2.12 CONTENTS_WRITE

```
procedure write (
    contents : in    Pcte_contents.contents_handle;
    data     : in    Pcte.string;
    actual_size : out Pcte.natural;
    status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 12.2.13 DEVICE_GET_CONTROL

-- See 11.2.

-- 12.2.14 DEVICE_SET_CONTROL

-- See 11.2.

-- 18.3.1 CONTENTS_COPY_FROM_FOREIGN_SYSTEM

```
procedure copy_from_foreign_system (
    file           : in    Pcte.object_reference;
    foreign_system : in    Pcte.object_reference;
    foreign_name   : in    Pcte.string;
    foreign_parameters : in Pcte.string;
    status         : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 18.3.2 CONTENTS_COPY_TO_FOREIGN_SYSTEM

```
procedure copy_to_foreign_system (
    file           : in    Pcte.object_reference;
    foreign_system : in    Pcte.object_reference;
    foreign_name   : in    Pcte.string;
    foreign_parameters : in Pcte.string;
    status         : in    Pcte_error.handle := EXCEPTION_ONLY);
```

private

implementation-defined

end Pcte_contents;

13 Process execution

with Pcte, Pcte_error, Pcte_mandatory, Pcte_discretionary, SYSTEM;

package Pcte_process **is**

use Pcte, Pcte_error, Pcte.reference;

13.1 Process execution datatypes

type initial_status **is** (RUNNING, STOPPED, SUSPENDED);

-- Pcte_process.initial_status corresponds to the PCTE datatype Initial_status.

EXIT_SUCCESS : **constant** Pcte.integer := *implementation-defined*;

EXIT_ERROR : **constant** Pcte.integer := *implementation-defined*;

FORCED_TERMINATION : **constant** Pcte.integer := *implementation-defined*;

SYSTEM_FAILURE : **constant** Pcte.integer := *implementation-defined*;

ACTIVITY_ABORTED : **constant** Pcte.integer := *implementation-defined*;

-- These constants define the possible termination status of a process.

subtype address **is** SYSTEM.ADDRESS;

-- Pcte_process.address corresponds to the PCTE datatype Address.

type profile_handle **is limited private**;

-- Pcte_process.profile_handle corresponds to the PCTE datatype Profile_handle.

-- The semantics of the operations of this package are defined in 8.2.8.

package profile_buffer **is**

type sequence **is limited private**;

-- Pcte_process.profile_buffer.sequence corresponds to the PCTE datatype Buffer.

function get (

list : Pcte_process.profile_buffer.sequence;

index : Pcte.natural := Pcte.natural'FIRST;

status : Pcte_error.handle := EXCEPTION_ONLY)

return Pcte.natural;

```

procedure insert (
    list      : in out    Pcte_process.profile_buffer.sequence;
    item      : in        Pcte.natural;
    index     : in        Pcte.natural := Pcte.natural'LAST;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

procedure replace (
    list      : in out    Pcte_process.profile_buffer.sequence;
    item      : in        Pcte.natural;
    index     : in        Pcte.natural := Pcte.natural'LAST;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

procedure append (
    list      : in out    Pcte_process.profile_buffer.sequence;
    item      : in        Pcte.natural;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

procedure delete (
    list      : in out    Pcte_process.profile_buffer.sequence;
    index     : in        Pcte.natural := Pcte.natural'FIRST;
    count     : in        Pcte.positive := Pcte.positive'LAST;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

procedure copy (
    into_list  : in out    Pcte_process.profile_buffer.sequence;
    from_list  : in        Pcte_process.profile_buffer.sequence;
    into_index : in        Pcte.natural := Pcte.natural'LAST;
    from_index : in        Pcte.natural := Pcte.natural'FIRST;
    count      : in        Pcte.positive := Pcte.positive'LAST;
    status     : in        Pcte_error.handle := EXCEPTION_ONLY);

function length_of (
    list      : Pcte_process.profile_buffer.sequence;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.natural;

function index_of (
    list      : Pcte_process.profile_buffer.sequence;
    item      : Pcte.natural;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.integer;

function are_equal (
    first      : Pcte_process.profile_buffer.sequence;
    second     : Pcte_process.profile_buffer.sequence;
    status     : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.boolean;

procedure normalize (
    list      : in out    Pcte_process.profile_buffer.sequence;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

```



```

procedure discard (
    list      : in out  Pcte_process.profile_buffer.sequence;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

private

implementation-defined

end profile_buffer;

-- The semantics of the operations of this package are defined in 8.2.8.

package names **is**

type sequence **is limited private**;

-- Pcte_process.names.sequence corresponds to the PCTE datatype Name_sequence.

```

function get (
    list      : Pcte_process.names.sequence;
    index     : Pcte.natural := Pcte.natural'FIRST;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.name;

```

```

procedure insert (
    list      : in out  Pcte_process.names.sequence;
    item      : in      Pcte.name;
    index     : in      Pcte.natural := Pcte.natural'LAST;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure replace (
    list      : in out  Pcte_process.names.sequence;
    item      : in      Pcte.name;
    index     : in      Pcte.natural := Pcte.natural'LAST;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure append (
    list      : in out  Pcte_process.names.sequence;
    item      : in      Pcte.name;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure delete (
    list      : in out  Pcte_process.names.sequence;
    index     : in      Pcte.natural := Pcte.natural'FIRST;
    count     : in      Pcte.positive := Pcte.positive'LAST;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure copy (
  into_list    : in out    Pcte_process.names.sequence;
  from_list    : in        Pcte_process.names.sequence;
  into_index   : in        Pcte.natural := Pcte.natural'LAST;
  from_index   : in        Pcte.natural := Pcte.natural'FIRST;
  count        : in        Pcte.positive := Pcte.positive'LAST;
  status       : in        Pcte_error.handle := EXCEPTION_ONLY);

```

```

function length_of (
  list        : Pcte_process.names.sequence;
  status      : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.natural;

```

```

function index_of (
  list        : Pcte_process.names.sequence;
  item        : Pcte.name;
  status      : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.integer;

```

```

function are_equal (
  first       : Pcte_process.names.sequence;
  second      : Pcte_process.names.sequence;
  status      : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.boolean;

```

```

procedure normalize (
  list        : in out    Pcte_process.names.sequence;
  status      : in        Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure discard (
  list        : in out    Pcte_process.names.sequence;
  status      : in        Pcte_error.handle := EXCEPTION_ONLY);

```

private

implementation-defined

end names;

13.2 Process execution

-- 13.2.1 PROCESS_CREATE

```

procedure create (
  static_context : in        Pcte.object_reference;
  process_type   : in        Pcte.type_reference;
  implicit_deletion : in      Pcte.boolean;
  access_mask    : in        Pcte_discretionary.object.atomic_access_rights;
  new_process    : in out    Pcte.object_reference;
  parent         : in        Pcte.object_reference := CURRENT_PROCESS;
  site           : in        Pcte.object_reference := LOCAL_EXECUTION_SITE;
  status         : in        Pcte_error.handle := EXCEPTION_ONLY);

```

-- 13.2.2 PROCESS_CREATE_AND_START

```
procedure create_and_start (
    static_context    : in      Pcte.object_reference;
    arguments         : in      Pcte.string;
    environment       : in      Pcte.string;
    implicit_deletion : in      Pcte.boolean;
    access_mask       : in      Pcte_discretionary.object.atomic_access_rights;
    new_process       : in out  Pcte.object_reference;
    site              : in      Pcte.object_reference := LOCAL_EXECUTION_SITE;
    status            : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.3 PROCESS_GET_WORKING_SCHEMA

```
procedure get_working_schema (
    sds_sequence : in out  Pcte_process.names.sequence;
    process      : in      Pcte.object_reference := CURRENT_PROCESS;
    status       : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.4 PROCESS_INTERRUPT_OPERATION

```
procedure interrupt_operation (
    process : in      Pcte.object_reference;
    status  : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.5 PROCESS_RESUME

```
procedure resume (
    process : in      Pcte.object_reference;
    status  : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.6 PROCESS_SET_ALARM

```
procedure set_alarm (
    duration : in      Pcte.natural;
    status   : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.7 PROCESS_SET_FILE_SIZE_LIMIT

```
procedure set_file_size_limit (
    fslimit : in      Pcte.natural;
    process : in      Pcte.object_reference := CURRENT_PROCESS;
    status  : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.8 PROCESS_SET_OPERATION_TIME_OUT

```
procedure set_operation_time_out (
    duration : in      Pcte.natural;
    status   : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.9 PROCESS_SET_PRIORITY

```
procedure set_priority (
  priority   : in    Pcte.natural;
  process    : in    Pcte.object_reference := CURRENT_PROCESS;
  status     : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.10 PROCESS_SET_REFERENCED_OBJECT

```
procedure set_referenced_object (
  reference_name : in    Pcte.actual_key;
  object         : in    Pcte.object_reference;
  process        : in    Pcte.object_reference := CURRENT_PROCESS;
  status        : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.11 PROCESS_SET_TERMINATION_STATUS

```
procedure set_termination_status (
  termination_status : in    Pcte.integer;
  status            : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.12 PROCESS_SET_WORKING_SCHEMA

```
procedure set_working_schema (
  sds_sequence : in    Pcte_process.names.sequence;
  process      : in    Pcte.object_reference := CURRENT_PROCESS;
  status       : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.13 PROCESS_START

```
procedure start (
  process      : in    Pcte.object_reference;
  arguments    : in    Pcte.string;
  environment  : in    Pcte.string;
  initial_status : in    Pcte_process.initial_status;
  status       : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure start (
  process      : in    Pcte.object_reference;
  arguments    : in    Pcte.string;
  environment  : in    Pcte.string;
  site        : in    Pcte.object_reference;
  initial_status : in    Pcte_process.initial_status;
  status       : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.14 PROCESS_SUSPEND

```
procedure suspend (
  process : in    Pcte.object_reference := CURRENT_PROCESS;
  alarm   : in    Pcte.natural := 0;
  status  : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.15 PROCESS_TERMINATE

```
procedure terminate_process (
    process          : in    Pcte.object_reference := CURRENT_PROCESS;
    termination_status : in    Pcte.integer := FORCED_TERMINATION;
    status           : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- The name of the procedure is modified because 'terminate' is an Ada reserved word.

-- 13.2.16 PROCESS_UNSET_REFERENCED_OBJECT

```
procedure unset_referenced_object (
    reference_name : in    Pcte.actual_key;
    process        : in    Pcte.object_reference := CURRENT_PROCESS;
    status         : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.17 PROCESS_WAIT_FOR_ANY_CHILD

```
procedure wait_for_any_child (
    termination_status : out Pcte.integer;
    child             : out Pcte.natural;
    status            : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.2.18 PROCESS_WAIT_FOR_CHILD

```
procedure wait_for_child (
    child          : in    Pcte.object_reference;
    termination_status : out Pcte.integer;
    status         : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 22.3.1 PROCESS_SET_CONSUMER_IDENTITY

```
procedure set_consumer_identity (
    group : in    Pcte.object_reference;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 22.3.2 PROCESS_UNSET_CONSUMER_IDENTITY

```
procedure unset_consumer_identity (
    status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

13.3 Security operations

-- 13.3.1 PROCESS_ADOPT_USER_GROUP

```
procedure adopt_user_group (
    user_group : in    Pcte.object_reference;
    process    : in    Pcte.object_reference := CURRENT_PROCESS;
    status     : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.3.2 PROCESS_GET_DEFAULT_ACL

```
procedure get_default_acl (
    acl      : in out    Pcte_discretionary.object.acl_entries.sequence;
    status   : in        Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.3.3 PROCESS_GET_DEFAULT_OWNER

```
function get_default_owner (
    status    : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte_discretionary.group_identifier;
```

-- 13.3.4 PROCESS_SET_ADOPTABLE_FOR_CHILD

```
procedure set_adoptable_for_child (
    user_group : in      Pcte.object_reference;
    adoptability : in    Pcte.boolean;
    process    : in      Pcte.object_reference := CURRENT_PROCESS;
    status     : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.3.5 PROCESS_SET_DEFAULT_ACL_ENTRY

```
procedure set_default_acl_entry (
    group      : in      Pcte_discretionary.group_identifier;
    modes      : in      Pcte_discretionary.object.atomic_access_rights;
    process    : in      Pcte.object_reference := CURRENT_PROCESS;
    status     : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.3.6 PROCESS_SET_DEFAULT_OWNER

```
procedure set_default_owner (
    group      : in      Pcte_discretionary.group_identifier;
    process    : in      Pcte.object_reference := CURRENT_PROCESS;
    status     : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.3.7 PROCESS_SET_USER

```
procedure set_user (
    user       : in      Pcte.object_reference;
    user_group : in      Pcte.object_reference;
    status     : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 20.4.1 PROCESS_SET_CONFIDENTIALITY_LABEL

```
procedure set_confidentiality_label (
    confidentiality_label : in    Pcte_mandatory.security_label;
    process               : in    Pcte.object_reference := CURRENT_PROCESS;
    status                : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 20.4.2 PROCESS_SET_FLOATING_CONFIDENTIALITY_LEVEL

```
procedure set_floating_confidentiality_level (
    floating_mode : in    Pcte_mandatory.floating_level;
    process       : in    Pcte.object_reference := CURRENT_PROCESS;
    status        : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 20.4.3 PROCESS_SET_FLOATING_INTEGRITY_LEVEL

```
procedure set_floating_integrity_level (
    floating_mode : in    Pcte_mandatory.floating_level;
    process       : in    Pcte.object_reference := CURRENT_PROCESS;
    status        : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 20.4.4 PROCESS_SET_INTEGRITY_LABEL

```
procedure set_integrity_label (
    integrity_label : in    Pcte_mandatory.security_label;
    process         : in    Pcte.object_reference := CURRENT_PROCESS;
    status          : in    Pcte_error.handle := EXCEPTION_ONLY);
```

13.4 Profiling operations

-- 13.4.1 PROCESS_PROFILING_OFF

```
procedure profiling_off (
    handle : in    Pcte_process.profile_handle;
    buffer : in out Pcte_process.profile_buffer.sequence;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.4.2 PROCESS_PROFILING_ON

```
procedure profiling_on (
    start      : in    Pcte_process.address;
    pcte_end   : in    Pcte_process.address;
    count      : in    Pcte.natural;
    handle     : out   Pcte_process.profile_handle;
    status     : in    Pcte_error.handle := EXCEPTION_ONLY);
```

13.5 Monitoring operations

-- 13.5.1 PROCESS_ADD_BREAKPOINT

```
procedure add_breakpoint (
    process      : in    Pcte.object_reference;
    breakpoint   : in    Pcte_process.address;
    status       : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.5.2 PROCESS_CONTINUE

```
procedure continue (
    process    : in    Pcte.object_reference;
    status     : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.5.3 PROCESS_PEEK

```
generic
    type process_data is private;
function peek (
    process    : Pcte.object_reference
    address    : Pcte_process.address;
    status     : Pcte_error.handle := EXCEPTION_ONLY)
    return     process_data;
```

-- 13.5.4 PROCESS_POKE

```
generic
    type process_data is private;
procedure poke (
    process    : in    Pcte.object_reference;
    address    : in    Pcte_process.address;
    value      : in    process_data;
    status     : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.5.5 PROCESS_REMOVE_BREAKPOINT

```
procedure remove_breakpoint (
    process    : in    Pcte.object_reference;
    breakpoint : in    Pcte_process.address;
    status     : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 13.5.6 PROCESS_WAIT_FOR_BREAKPOINT

```
procedure wait_for_breakpoint (
    process    : in    Pcte.object_reference;
    breakpoint : out   Pcte_process.address;
    status     : in    Pcte_error.handle := EXCEPTION_ONLY);
```

private

implementation-defined

end Pcte_process;

14 Message queues

with Pcte, Pcte_error;

package Pcte_message **is**

use Pcte_error;

14.1 Message queue datatypes

```

type standard_message_type is (INTERRUPT_MSG, QUIT_MSG, FINISH_MSG,
    SUSPEND_MSG, END_MSG, ABORT_MSG, DEADLOCK_MSG, WAKE_MSG);

-- Pcte_message.standard_message_type corresponds to the PCTE datatype
-- Standard_message_type.

type notification_message_type is (MODIFICATION_MSG, CHANGE_MSG,
    DELETE_MSG, MOVE_MSG, NOT_ACCESSIBLE_MSG, LOST_MSG);

-- Pcte_message.notification_message_type corresponds to the PCTE datatype
-- Notification_message_type.

type implementation_defined_message_type is new Pcte.natural;

-- Pcte_message.implementation_defined_message_type corresponds to the PCTE
-- datatype Implementation_defined_message_type.

type undefined_message_type is new Pcte.natural;

-- Pcte_message.undefined_message_type corresponds to the PCTE datatype
-- Undefined_message_type.

type message_type_kind is (STANDARD_MESSAGE,
    NOTIFICATION_MESSAGE, IMPLEMENTATION_DEFINED_MESSAGE,
    UNDEFINED_MESSAGE);

type message_type (
    kind : Pcte_message.message_type_kind := STANDARD_MESSAGE)
is record
    case kind is
        when STANDARD_MESSAGE =>
            standard : Pcte_message.standard_message_type;
        when NOTIFICATION_MESSAGE =>
            notification : Pcte_message.notification_message_type;
        when IMPLEMENTATION_DEFINED_MESSAGE =>
            implementation_defined :
                Pcte_message.implementation_defined_message_type;
        when UNDEFINED_MESSAGE =>
            undefined : Pcte_message.undefined_message_type;
    end case;
end record;

type received_message (
    string_length : Pcte.string_length := 0)
is record
    pcte_type : Pcte_message.message_type;
    message_received : Pcte.boolean;
    position : Pcte.natural;
    data : Pcte.string(1..string_length);
end record;

-- Pcte_message.received_message corresponds to the PCTE datatype Received_message.

```

type receive_mode is (PEEK, NO_WAIT, WAIT);

-- The values of Pcte_message.receive_mode determine the mapping of the operations
 -- MESSAGE_PEEK, MESSAGE_RECEIVE_NO_WAIT, and MESSAGE_RECEIVE_WAIT.

subtype send_mode is Pcte_message.receive_mode **range** NO_WAIT .. WAIT;

-- The values of Pcte_message.send_mode distinguish between calls corresponding to
 -- MESSAGE_SEND_NO_WAIT and MESSAGE_SEND_WAIT.

-- The semantics of the operations of this package are defined in 8.2.8.

package message_types is

type sequence is **limited private**;

-- Pcte_message.message_types.sequence corresponds to the PCTE
 -- datatype Message_types.

function get (

list : Pcte_message.message_types.sequence;
 index : Pcte.natural := Pcte.natural'FIRST;
 status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte_message.message_type;

procedure insert (

list : **in out** Pcte_message.message_types.sequence;
 item : **in** Pcte_message.message_type;
 index : **in** Pcte.natural := Pcte.natural'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure replace (

list : **in out** Pcte_message.message_types.sequence;
 item : **in** Pcte_message.message_type;
 index : **in** Pcte.natural := Pcte.natural'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure append (

list : **in out** Pcte_message.message_types.sequence;
 item : **in** Pcte_message.message_type;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure delete (

list : **in out** Pcte_message.message_types.sequence;
 index : **in** Pcte.natural := Pcte.natural'FIRST;
 count : **in** Pcte.positive := Pcte.positive'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

```

procedure copy (
  into_list    : in out  Pcte_message.message_types.sequence;
  from_list    : in      Pcte_message.message_types.sequence;
  into_index   : in      Pcte.natural := Pcte.natural'LAST;
  from_index   : in      Pcte.natural := Pcte.natural'FIRST;
  count        : in      Pcte.positive := Pcte.positive'LAST;
  status       : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

function length_of (
  list        : Pcte_message.message_types.sequence;
  status      : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.natural;

```

```

function index_of (
  list        : Pcte_message.message_types.sequence;
  item        : Pcte_message.message_type;
  status      : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.integer;

```

```

function are_equal (
  first       : Pcte_message.message_types.sequence;
  second      : Pcte_message.message_types.sequence;
  status      : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.boolean;

```

```

procedure normalize (
  list        : in out  Pcte_message.message_types.sequence;
  status      : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure discard (
  list        : in out  Pcte_message.message_types.sequence;
  status      : in      Pcte_error.handle := EXCEPTION_ONLY);

```

private

implementation-defined

end message_types;

14.2 Message queue operations

-- 14.2.1 MESSAGE_DELETE

```

procedure delete (
  queue       : in      Pcte.object_reference;
  position    : in      Pcte.natural;
  status      : in      Pcte_error.handle := EXCEPTION_ONLY);

```

-- 14.2.2 MESSAGE_PEEK

-- The abstract operation MESSAGE_PEEK is mapped to the functions Pcte_message.receive with the parameter *mode* set to PEEK. The abstract operations MESSAGE_RECEIVE_NO_WAIT and MESSAGE_RECEIVE_WAIT are also mapped to this function, see below. The effect of assigning **set of** Message_type to the parameter *types* is achieved by the first overloaded function. The effect of assigning ALL_MESSAGE_TYPES to *types* is achieved by the second overloaded function.

function receive (

```
queue      : Pcte.object_reference;
types      : Pcte_message.message_types.sequence;
position   : Pcte.natural := 0;
mode       : Pcte_message.receive_mode := PEEK;
status     : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte_message.received_message;
```

function receive (

```
queue      : Pcte.object_reference;
position   : Pcte.natural := 0;
mode       : Pcte_message.receive_mode := PEEK;
status     : Pcte_error.handle := EXCEPTION_ONLY)
return     Pcte_message.received_message;
```

-- 14.2.3 MESSAGE_RECEIVE_NO_WAIT

-- This abstract operation is mapped to the functions Pcte_message.receive with the parameter *mode* set to NO_WAIT.

-- 14.2.4 MESSAGE_RECEIVE_WAIT

-- This abstract operation is mapped to the functions Pcte_message.receive with the parameter *mode* set to WAIT.

-- 14.2.5 MESSAGE_SEND_NO_WAIT

-- This abstract operation is mapped to the procedure Pcte_message.send with the parameter *mode* set to NO_WAIT. The parameters *message_data* and *message_type* correspond respectively to the DATA and MESSAGE_TYPE fields of the PCTE datatype Message.

procedure send (

```
queue      : in Pcte.object_reference;
message_data : in Pcte.string;
message_type : in Pcte_message.message_type;
mode       : in Pcte_message.send_mode := NO_WAIT;
status     : in Pcte_error.handle := EXCEPTION_ONLY);
```

-- 14.2.6 MESSAGE_SEND_WAIT

-- This abstract operation is mapped to the procedure Pcte_message.send with the parameter *mode* set to WAIT.

end Pcte_message;

with Pcte, Pcte_error, Pcte_message;

package Pcte_queue **is**

use Pcte_error, Pcte_message;

 -- 14.2.7 QUEUE_EMPTY

procedure empty (

 queue : **in** Pcte.object_reference;

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

 -- 14.2.8 QUEUE_HANDLER_DISABLE

procedure handler_disable (

 queue : **in** Pcte.object_reference;

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

 -- 14.2.9 QUEUE_HANDLER_ENABLE

 -- The effect of assigning **set of** Message_type to the parameter *types* is achieved by the first
 -- overloaded procedure. The effect of assigning ALL_MESSAGE_TYPES to *types* is
 -- achieved by the second overloaded procedure.

generic

with procedure handler (

 queue : **in** Pcte.object_reference);

package handlers **is**

procedure enable (

 queue : **in** Pcte.object_reference;

 types : **in** Pcte_message.message_types.sequence;

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure enable (

 queue : **in** Pcte.object_reference;

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

end handlers;

 -- 14.2.10 QUEUE_RESERVE

procedure reserve (

 queue : **in** Pcte.object_reference;

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

 -- 14.2.11 QUEUE_RESTORE

procedure restore (

 queue : **in** Pcte.object_reference;

 file : **in** Pcte.object_reference;

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 14.2.12 QUEUE_SAVE

```
procedure save (
  queue : in    Pcte.object_reference;
  file   : in    Pcte.object_reference;
  status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 14.2.13 QUEUE_SET_TOTAL_SPACE

```
procedure set_total_space (
  queue       : in    Pcte.object_reference;
  total_space : in    Pcte.natural;
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 14.2.14 QUEUE_UNRESERVE

```
procedure unreserve (
  queue : in    Pcte.object_reference;
  status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end Pcte_queue;

15 Notification

with Pcte, Pcte_error, Pcte_message;

package Pcte_notify **is**

use Pcte_error;

15.1 Notification datatypes

type access_event **is** (MODIFICATION_EVENT, CHANGE_EVENT, DELETE_EVENT, MOVE_EVENT);

-- Pcte_notify.access_event corresponds to the PCTE datatype Access_event.

type access_events **is array** (Pcte_notify.access_event) **of** Pcte.boolean;

-- Pcte_notify.access_events corresponds to the PCTE datatype Access_events.

15.2 Notification operations

-- 15.2.1 NOTIFICATION_MESSAGE_GET_KEY

```
function get_key (
  message : Pcte_message.received_message;
  status   : Pcte_error.handle := EXCEPTION_ONLY)
return    Pcte.natural;
```

-- 15.2.2 NOTIFY_CREATE

```
procedure create (
  notifier_key : in    Pcte.natural;
  queue       : in    Pcte.object_reference;
  object      : in    Pcte.object_reference;
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 15.2.3 NOTIFY_DELETE

```
procedure delete (
  notifier_key : in    Pcte.natural;
  queue       : in    Pcte.object_reference;
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 15.2.4 NOTIFY_SWITCH_EVENTS

```
procedure switch_events (
  notifier_key : in    Pcte.natural;
  queue       : in    Pcte.object_reference;
  access_events : in    Pcte_notify.access_events;
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end Pcte_notify;

16 Concurrency and integrity control

with Pcte, Pcte_error;

package Pcte_activity **is**

use Pcte_error;

16.1 Concurrency and integrity control datatypes

type activity_class **is** (UNPROTECTED, PROTECTED, TRANSACTION);

 -- Pcte_activity.activity_class corresponds to the PCTE datatype Activity_class.

16.2 Concurrency and integrity control operations

-- 16.2.1 ACTIVITY_ABORT

```
procedure abort_activity (
  status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- The name of the procedure is modified because 'abort' is an Ada reserved word.

-- 16.2.2 ACTIVITY_END

```
procedure end_activity (
  status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- The name of the procedure is modified because 'end' is an Ada reserved word.

-- 16.2.3 ACTIVITY_START

procedure start_activity (

 activity_class : **in** Pcte_activity.activity_class;

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- The name of the procedure is modified to retain the analogy with Pcte_activity.

-- end_activity.

package lock is

type lock_set_mode is (READ_UNPROTECTED, READ_SEMIPROTECTED,
 WRITE_UNPROTECTED, WRITE_SEMIPROTECTED,
 DELETE_UNPROTECTED, DELETE_SEMIPROTECTED, READ_PROTECTED,
 DELETE_PROTECTED, WRITE_PROTECTED, WRITE_TRANSACTIONED,
 DELETE_TRANSACTIONED, READ_DEFAULT, WRITE_DEFAULT,
 DELETE_DEFAULT);

-- Pcte_activity.lock.lock_set_mode corresponds to the PCTE datatype Lock_set_mode.

subtype internal_mode is Pcte_activity.lock.lock_set_mode

range READ_UNPROTECTED .. WRITE_PROTECTED;

-- Pcte_activity.lock.internal_mode corresponds to the PCTE datatype

-- Lock_internal_mode.

-- 16.2.4 LOCK_RESET_INTERNAL_MODE

procedure reset_internal_mode (

 object : **in** Pcte.object_reference;

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 16.2.5 LOCK_SET_INTERNAL_MODE

procedure set_internal_mode (

 object : **in** Pcte.object_reference;

 lock_mode : **in** Pcte_activity.lock.internal_mode;

 wait_flag : **in** Pcte.boolean := TRUE;

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 16.2.6 LOCK_SET_OBJECT

procedure set_object (

 object : **in** Pcte.object_reference;

 lock_mode : **in** Pcte_activity.lock.lock_set_mode;

 wait_flag : **in** Pcte.boolean;

 scope : **in** Pcte.object_scope;

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 16.2.7 LOCK_UNSET_OBJECT

```
procedure unset_object (
    object : in    Pcte.object_reference;
    scope  : in    Pcte.object_scope;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end lock;

end Pcte_activity;

17 Replication

with Pcte, Pcte_error;

package Pcte_replica_set **is**

use Pcte_error;

17.1 Replication datatypes

-- None.

17.2 Replication operations

-- 17.2.1 REPLICA_SET_ADD_COPY_VOLUME

```
procedure add_copy_volume (
    replica_set      : in    Pcte.object_reference;
    copy_volume      : in    Pcte.object_reference;
    status           : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 17.2.2 REPLICA_SET_CREATE

```
procedure create (
    master_volume    : in    Pcte.object_reference;
    identifier       : in    Pcte.natural;
    replica_set      : in out Pcte.object_reference;
    status           : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 17.2.3 REPLICA_SET_REMOVE

```
procedure remove (
    replica_set      : in    Pcte.object_reference;
    status           : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 17.2.4 REPLICA_SET_REMOVE_COPY_VOLUME

```
procedure remove_copy_volume (
    replica_set      : in    Pcte.object_reference;
    copy_volume      : in    Pcte.object_reference;
    status           : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```

end Pcte_replica_set;

with Pcte, Pcte_error;
package Pcte_replicated_object is
    use Pcte_error;

    -- 17.2.5 REPLICATED_OBJECT_CREATE
    procedure create (
        replica_set    : in    Pcte.object_reference;
        object         : in    Pcte.object_reference;
        status         : in    Pcte_error.handle := EXCEPTION_ONLY);

    -- 17.2.6 REPLICATED_OBJECT_DELETE_REPLICA
    procedure delete_replica (
        object         : in    Pcte.object_reference;
        copy_volume    : in    Pcte.object_reference;
        status         : in    Pcte_error.handle := EXCEPTION_ONLY);

    -- 17.2.7 REPLICATED_OBJECT_DUPLICATE
    procedure duplicate (
        object         : in    Pcte.object_reference;
        volume         : in    Pcte.object_reference;
        copy_volume    : in    Pcte.object_reference;
        status         : in    Pcte_error.handle := EXCEPTION_ONLY);

    -- 17.2.8 REPLICATED_OBJECT_REMOVE
    procedure remove (
        object : in    Pcte.object_reference;
        status : in    Pcte_error.handle := EXCEPTION_ONLY);

    -- 17.2.9 WORKSTATION_SELECT_REPLICA_VOLUME
    -- See 18.2.

    -- 17.2.10 WORKSTATION_UNSELECT_REPLICA_VOLUME
    -- See 18.2.

end Pcte_replicated_object;

```

18 Network connection

```

with Pcte, Pcte_error, Pcte_device, Pcte_discretionary, Pcte_volume;
package Pcte_workstation is
    use Pcte, Pcte_error, Pcte.reference;

```

18.1 Network connection datatypes

```

type connection_status is (LOCAL, CLIENT, CONNECTED, AVAILABLE);
-- Pcte_workstation.connection_status corresponds to the PCTE datatype Connection_status.

subtype requested_connection_status is Pcte_workstation.connection_status
  range LOCAL .. CONNECTED;
-- Pcte_workstation.requested_connection_status corresponds to the PCTE datatype
-- Requested_connection_status.

type work_status_item is (ACTIVITY_REMOTE_LOCKS, ACTIVITY_LOCAL_LOCKS,
  TRANSACTION_REMOTE_LOCKS, TRANSACTION_LOCAL_LOCKS,
  QUEUE_REMOTE, QUEUE_LOCAL, RECEIVE_REMOTE, RECEIVE_LOCAL,
  CHILD_REMOTE, CHILD_LOCAL);
-- Pcte_workstation.work_status_item corresponds to the PCTE datatype Work_status_item.

type work_status is array (Pcte_workstation.work_status_item) of Pcte.boolean;
-- Pcte_workstation.work_status corresponds to the PCTE datatype Work_status_item.

type workstation_status is record
  connection    : Pcte_workstation.connection_status;
  work          : Pcte_workstation.work_status;
end record;
-- Pcte_workstation.workstation_status corresponds to the PCTE datatype
-- Workstation_status.

```

18.2 Network connection operations

```

-- 18.2.1 WORKSTATION_CONNECT

procedure connect (
  pcte_status : in    Pcte_workstation.requested_connection_status;
  status      : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 18.2.2 WORKSTATION_CREATE

-- The effect of assigning a Volume_designator to the parameter administration_volume is
-- obtained by the first overloaded procedure. The effect of assigning a
-- New_administration_volume to administration_volume is obtained by the second
-- overloaded procedure.

procedure create (
  execution_site_identifier : in    Pcte.natural;
  administration_volume    : in    Pcte.object_reference;
  access_mask              : in    Pcte_discretionary.object.atomic_access_rights;
  node_name                : in    Pcte.text;
  machine_name             : in    Pcte.text;
  status                   : in    Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure create (
    execution_site_identifier : in    Pcte.natural;
    foreign_device           : in    Pcte.string;
    administration_volume   : in    Pcte_volume.volume_identifier;
    volume_characteristics   : in    Pcte.string;
    device                   : in    Pcte_device.device_identifier;
    device_characteristics   : in    Pcte.string;
    access_mask              : in    Pcte_discretionary.object.atomic_access_rights;
    node_name                : in    Pcte.text;
    machine_name             : in    Pcte.text;
    status                   : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 18.2.3 WORKSTATION_DELETE

procedure delete (
    station : in    Pcte.object_reference;
    status  : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 18.2.4 WORKSTATION_DISCONNECT

procedure disconnect (
    status : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 18.2.5 WORKSTATION_GET_STATUS

function get_status (
    station : Pcte.object_reference := LOCAL_WORKSTATION;
    status  : Pcte_error.handle := EXCEPTION_ONLY)
return    Pcte_workstation.workstation_status;

-- 18.2.6 WORKSTATION_REDUCE_CONNECTION

procedure reduce_connection (
    pcte_status : in    Pcte_workstation.requested_connection_status;
    station     : in    Pcte.object_reference := LOCAL_WORKSTATION;
    force       : in    Pcte.boolean;
    status      : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 17.2.9 WORKSTATION_SELECT_REPLICA_VOLUME

procedure select_replica_volume (
    station      : in    Pcte.object_reference;
    replica_set  : in    Pcte.object_reference;
    volume       : in    Pcte.object_reference;
    status       : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 17.2.10 WORKSTATION_UNSELECT_REPLICA_VOLUME

procedure unselect_replica_volume (
    station      : in    Pcte.object_reference;
    replica_set  : in    Pcte.object_reference;
    status       : in    Pcte_error.handle := EXCEPTION_ONLY);

```

end Pcte_workstation;

18.3 Foreign system operations

-- 18.3.1 CONTENTS_COPY_FROM_FOREIGN_SYSTEM

-- See 12.2.

-- 18.3.2 CONTENTS_COPY_TO_FOREIGN_SYSTEM

-- See 12.2.

18.4 Time operations

with Pcte, Pcte_error;

package Pcte_time **is**

use Pcte_error;

 -- 18.4.1 TIME_GET

function get (

 status : Pcte_error.handle := EXCEPTION_ONLY)

return Pcte.calendar.time;

 -- 18.4.2 TIME_SET

procedure set (

 time : **in** Pcte.calendar.time;

 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

end Pcte_time;

19 Discretionary security

with Pcte, Pcte_error;

package Pcte_discretionary **is**

use Pcte_error;

19.1 Discretionary security datatypes

type group_identifier **is new** Pcte.natural;

 -- Pcte_discretionary.group_identifier corresponds to the PCTE datatype Group_identifier.

package object **is**

type mode_value **is** (UNCHANGED, GRANTED, UNDEFINED, DENIED,
 PARTIALLY_DENIED);

subtype requested_mode_value **is** Pcte_discretionary.object.mode_value
 range UNCHANGED .. DENIED;

subtype access_mode_value **is** Pcte_discretionary.object.mode_value
range GRANTED .. PARTIALLY_DENIED;

-- Pcte_discretionary.object.access_mode_value corresponds to the PCTE datatype
 -- Discretionary_access_mode_value.

subtype atomic_access_mode_value **is** Pcte_discretionary.object.mode_value
range GRANTED .. DENIED;

-- Pcte_discretionary.object.atomic_access_mode_value corresponds to the PCTE
 -- datatype Atomic_discretionary_access_mode_value.

type access_mode **is** (APPEND_CONTENTS, APPEND_IMPLICIT, APPEND_LINKS,
 CONTROL_DISCRETIONARY, CONTROL_MANDATORY,
 CONTROL_OBJECT, DELETE, EXECUTE,
 EXPLOIT_CONSUMER_IDENTITY, EXPLOIT_DEVICE, EXPLOIT_SCHEMA,
 NAVIGATE, OWNER, READ_ATTRIBUTES, READ_CONTENTS,
 READ_LINKS, STABILIZE, WRITE_ATTRIBUTES, WRITE_CONTENTS,
 WRITE_IMPLICIT, WRITE_LINKS);

-- Pcte_discretionary.object.access_mode corresponds to the PCTE datatype
 -- Discretionary_access_mode.

type access_modes **is array** (Pcte_discretionary.object.access_mode) **of** Pcte.boolean;

-- Pcte_discretionary.object.access_modes corresponds to the PCTE datatype
 -- Discretionary_access_modes.

type requested_access_rights **is array** (Pcte_discretionary.object.access_mode)
of Pcte_discretionary.object.requested_mode_value;

type access_rights **is array** (Pcte_discretionary.object.access_mode)
of Pcte_discretionary.object.access_mode_value;

-- Pcte_discretionary.object.access_rights corresponds to the PCTE datatype
 -- Access_rights. The element indexed by a particular Pcte_discretionary.object.
 -- access_mode value in an access_rights value corresponds to the image of the
 -- corresponding Access_mode value in the corresponding Access_rights map.

type atomic_access_rights **is array** (Pcte_discretionary.object.access_mode)
of Pcte_discretionary.object.atomic_access_mode_value;

-- Pcte_discretionary.object.atomic_access_rights corresponds to the PCTE datatype
 -- Atomic_access_rights. The element indexed by a particular Pcte_discretionary.object.
 -- access_mode value in an atomic_access_rights value corresponds to the image of the
 -- corresponding Access_mode value in the corresponding Atomic_access_rights map.

type acl_entry **is record**
 group : Pcte_discretionary.group_identifier;
 access_mask : Pcte_discretionary.object.access_rights;
end record;

-- Pcte_discretionary.object.acl_entry corresponds to the maplet type of the PCTE
 -- datatype Acl, i.e. the fields of a record of that type correspond to a group identifier and
 -- its image Access_rights value in some Acl map value.

-- The semantics of the operations of this package are defined in 8.2.8.

package acl_entries **is**

type sequence **is limited private**;

-- Pcte_discretionary.object.acl_entries.sequence corresponds to the PCTE datatype
-- Acl.

function get (

list : Pcte_discretionary.object.acl_entries.sequence;
index : Pcte.natural := Pcte.natural'FIRST;
status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte_discretionary.object.acl_entry;

procedure insert (

list : **in out** Pcte_discretionary.object.acl_entries.sequence;
item : **in** Pcte_discretionary.object.acl_entry;
index : **in** Pcte.natural := Pcte.natural'LAST;
status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure replace (

list : **in out** Pcte_discretionary.object.acl_entries.sequence;
item : **in** Pcte_discretionary.object.acl_entry;
index : **in** Pcte.natural := Pcte.natural'LAST;
status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure append (

list : **in out** Pcte_discretionary.object.acl_entries.sequence;
item : **in** Pcte_discretionary.object.acl_entry;
status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure delete (

list : **in out** Pcte_discretionary.object.acl_entries.sequence;
index : **in** Pcte.natural := Pcte.natural'FIRST;
count : **in** Pcte.positive := Pcte.positive'LAST;
status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure copy (

into_list : **in out** Pcte_discretionary.object.acl_entries.sequence;
from_list : **in** Pcte_discretionary.object.acl_entries.sequence;
into_index : **in** Pcte.natural := Pcte.natural'LAST;
from_index : **in** Pcte.natural := Pcte.natural'FIRST;
count : **in** Pcte.positive := Pcte.positive'LAST;
status : **in** Pcte_error.handle := EXCEPTION_ONLY);

function length_of (

list : Pcte_discretionary.object.acl_entries.sequence;
status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte.natural;

```

function index_of (
    list      : Pcte_discretionary.object.acl_entries.sequence;
    item      : Pcte_discretionary.object.acl_entry;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.integer;

function are_equal (
    first      : Pcte_discretionary.object.acl_entries.sequence;
    second     : Pcte_discretionary.object.acl_entries.sequence;
    status     : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.boolean;

procedure normalize (
    list      : in out Pcte_discretionary.object.acl_entries.sequence;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

procedure discard (
    list      : in out Pcte_discretionary.object.acl_entries.sequence;
    status    : in      Pcte_error.handle := EXCEPTION_ONLY);

private
    implementation-defined

end acl_entries;

```

19.2 Discretionary access control operations

-- 19.2.1 GROUP_GET_IDENTIFIER

-- See 19.3.

-- 19.2.2 OBJECT_CHECK_PERMISSION

```

function check_permission (
    object      : Pcte.object_reference;
    modes       : Pcte_discretionary.object.access_modes;
    scope       : Pcte.object_scope;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return        Pcte.boolean;

```

-- 19.2.3 OBJECT_GET_ACL

```

procedure get_acl (
    object : in      Pcte.object_reference;
    scope  : in      Pcte.object_scope;
    acl    : in out Pcte_discretionary.object.acl_entries.sequence;
    status : in      Pcte_error.handle := EXCEPTION_ONLY);

```


-- 19.2.4 OBJECT_SET_ACL_ENTRY

```
procedure set_acl_entry (
    object : in    Pcte.object_reference;
    group  : in    Pcte_discretionary.group_identifier;
    modes  : in    Pcte_discretionary.object.requested_access_rights;
    scope  : in    Pcte.object_scope;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end object;

19.3 Discretionary security administration operations

package group **is**

-- 19.2.1 GROUP_GET_IDENTIFIER

```
function get_identifier (
    group      : Pcte.object_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return       Pcte_discretionary.group_identifier;
```

-- 19.3.1 GROUP_INITIALIZE

```
function initialize (
    group      : Pcte.object_reference;
    status      : Pcte_error.handle := EXCEPTION_ONLY)
return       Pcte_discretionary.group_identifier;
```

-- 19.3.2 GROUP_REMOVE

```
procedure remove (
    group : in    Pcte.object_reference;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 19.3.3 GROUP_RESTORE

```
procedure restore (
    group      : in    Pcte.object_reference;
    identifier : in    Pcte_discretionary.group_identifier;
    status      : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end group;

package program_group **is**

-- 19.3.4 PROGRAM_GROUP_ADD_MEMBER

```
procedure add_member (
    group      : in    Pcte.object_reference;
    program    : in    Pcte.object_reference;
    status      : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```

-- 19.3.5 PROGRAM_GROUP_ADD_SUBGROUP
procedure add_subgroup (
    group      : in    Pcte.object_reference;
    subgroup   : in    Pcte.object_reference;
    status     : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 19.3.6 PROGRAM_GROUP_REMOVE_MEMBER
procedure remove_member (
    group      : in    Pcte.object_reference;
    program    : in    Pcte.object_reference;
    status     : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 19.3.7 PROGRAM_GROUP_REMOVE_SUBGROUP
procedure remove_subgroup (
    group      : in    Pcte.object_reference;
    subgroup   : in    Pcte.object_reference;
    status     : in    Pcte_error.handle := EXCEPTION_ONLY);
end program_group;

package user_group is

-- 19.3.8 USER_GROUP_ADD_MEMBER
procedure add_member (
    group : in    Pcte.object_reference;
    user  : in    Pcte.object_reference;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 19.3.9 USER_GROUP_ADD_SUBGROUP
procedure add_subgroup (
    group : in    Pcte.object_reference;
    subgroup : in    Pcte.object_reference;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 19.3.10 USER_GROUP_REMOVE_MEMBER
procedure remove_member (
    group : in    Pcte.object_reference;
    user  : in    Pcte.object_reference;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);

-- 19.3.11 USER_GROUP_REMOVE_SUBGROUP
procedure remove_subgroup (
    group : in    Pcte.object_reference;
    subgroup : in    Pcte.object_reference;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);
end user_group;

```

end Pcte_discretionary;

20 Mandatory security

with Pcte, Pcte_error, Pcte_discretionary;

package Pcte_mandatory **is**

use Pcte_error;

20.1 Mandatory security datatypes

type security_label **is new** Pcte.string;

-- Pcte_mandatory.security_label corresponds to the PCTE datatype Security_label.

type floating_level **is** (NO_FLOAT, FLOAT_IN, FLOAT_OUT, FLOAT_IN_OUT);

-- Pcte_mandatory.floating_level corresponds to the PCTE datatype Floating_level.

20.2 Mandatory security operations

package device **is**

-- 20.2.1 DEVICE_SET_CONFIDENTIALITY_RANGE

procedure set_confidentiality_range (
 device : **in** Pcte.object_reference;
 high_label: **in** Pcte_mandatory.security_label;
 low_label : **in** Pcte_mandatory.security_label;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 20.2.2 DEVICE_SET_INTEGRITY_RANGE

procedure set_integrity_range (
 device : **in** Pcte.object_reference;
 high_label: **in** Pcte_mandatory.security_label;
 low_label : **in** Pcte_mandatory.security_label;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

end device;

package execution_site **is**

-- 20.2.3 EXECUTION_SITE_SET_CONFIDENTIALITY_RANGE

procedure set_confidentiality_range (
 execution_site : **in** Pcte.object_reference;
 high_label : **in** Pcte_mandatory.security_label;
 low_label : **in** Pcte_mandatory.security_label;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

-- 20.2.4 EXECUTION_SITE_SET_INTEGRITY_RANGE

```
procedure set_integrity_range (
    execution_site : in    Pcte.object_reference;
    high_label     : in    Pcte_mandatory.security_label;
    low_label      : in    Pcte_mandatory.security_label;
    status         : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end execution_site;

package object is

-- 20.2.5 OBJECT_SET_CONFIDENTIALITY_LABEL

```
procedure set_confidentiality_label (
    object : in    Pcte.object_reference;
    label  : in    Pcte_mandatory.security_label;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 20.2.6 OBJECT_SET_INTEGRITY_LABEL

```
procedure set_integrity_label (
    object : in    Pcte.object_reference;
    label  : in    Pcte_mandatory.security_label;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end object;

package volume is

-- 20.2.7 VOLUME_SET_CONFIDENTIALITY_RANGE

```
procedure set_confidentiality_range (
    volume : in    Pcte.object_reference;
    high_label: in    Pcte_mandatory.security_label;
    low_label : in    Pcte_mandatory.security_label;
    status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 20.2.8 VOLUME_SET_INTEGRITY_RANGE

```
procedure set_integrity_range (
    volume : in    Pcte.object_reference;
    high_label: in    Pcte_mandatory.security_label;
    low_label : in    Pcte_mandatory.security_label;
    status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end volume;

20.3 Mandatory security administration operations

package confidentiality_class is

-- 20.3.1 CONFIDENTIALITY_CLASS_INITIALIZE

```
procedure initialize (
    object           : in    Pcte.object_reference;
    class_name       : in    Pcte.name;
    to_be_dominated  : in    Pcte.object_reference;
    status           : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure initialize (
    object           : in    Pcte.object_reference;
    class_name       : in    Pcte.name;
    status           : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end confidentiality_class;

package group is

-- 20.3.2 GROUP_DISABLE_FOR_CONFIDENTIALITY_DOWNGRADE

```
procedure disable_for_confidentiality_downgrade (
    group            : in    Pcte.object_reference;
    confidentiality_class : in    Pcte.object_reference;
    status           : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 20.3.3 GROUP_DISABLE_FOR_INTEGRITY_UPGRADE

```
procedure disable_for_integrity_upgrade (
    group            : in    Pcte.object_reference;
    integrity_class   : in    Pcte.object_reference;
    status           : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 20.3.4 GROUP_ENABLE_FOR_CONFIDENTIALITY_DOWNGRADE

```
procedure enable_for_confidentiality_downgrade (
    group            : in    Pcte.object_reference;
    confidentiality_class : in    Pcte.object_reference;
    status           : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 20.3.5 GROUP_ENABLE_FOR_INTEGRITY_UPGRADE

```
procedure enable_for_integrity_upgrade (
    group            : in    Pcte.object_reference;
    integrity_class   : in    Pcte.object_reference;
    status           : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end group;

package integrity_class is

-- 20.3.6 INTEGRITY_CLASS_INITIALIZE

```
procedure initialize (
    object          : in    Pcte.object_reference;
    class_name      : in    Pcte.name;
    to_be_dominated : in    Pcte.object_reference;
    status          : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure initialize (
    object      : in    Pcte.object_reference;
    class_name  : in    Pcte.name;
    status      : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end integrity_class;

package user **is**

-- 20.3.7 USER_EXTEND_CONFIDENTIALITY_CLEARANCE

```
procedure extend_confidentiality_clearance (
    user          : in    Pcte.object_reference;
    confidentiality_class : in    Pcte.object_reference;
    status        : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 20.3.8 USER_EXTEND_INTEGRITY_CLEARANCE

```
procedure extend_integrity_clearance (
    user          : in    Pcte.object_reference;
    integrity_class : in    Pcte.object_reference;
    status        : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 20.3.9 USER_REDUCE_CONFIDENTIALITY_CLEARANCE

```
procedure reduce_confidentiality_clearance (
    user          : in    Pcte.object_reference;
    confidentiality_class : in    Pcte.object_reference;
    status        : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 20.3.10 USER_REDUCE_INTEGRITY_CLEARANCE

```
procedure reduce_integrity_clearance (
    user          : in    Pcte.object_reference;
    integrity_class : in    Pcte.object_reference;
    status        : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end user;

end Pcte_mandatory;

20.4 Mandatory security operations for processes

-- See 13.3.

21 Auditing

with Pcte, Pcte_error, Pcte_discretionary, Pcte_mandatory;

package Pcte_audit **is**

use Pcte_error;

21.1 Auditing datatypes

type event_type **is** (WRITE, READ, COPY, ACCESS_CONTENTS, EXPLOIT, CHANGE_ACCESS_CONTROL_LIST, CHANGE_LABEL, USE_PREDEFINED_GROUP, SET_USER_IDENTITY, WRITE_CONFIDENTIALITY_VIOLATION, READ_CONFIDENTIALITY_VIOLATION, WRITE_INTEGRITY_VIOLATION, READ_INTEGRITY_VIOLATION, COVERT_CHANNEL, INFORMATION, CHANGE_IDENTIFICATION, SELECT_AUDIT_EVENT, SECURITY_ADMINISTRATION);

-- Pcte_audit.event_type corresponds to the union of the PCTE datatypes
-- Selectable_event_type and Mandatory_event_type.

subtype selectable_event_type **is** Pcte_audit.event_type **range** WRITE .. INFORMATION;

-- Pcte_audit.selectable_event_type corresponds to the PCTE datatype
-- Selectable_event_type.

subtype mandatory_event_type **is** Pcte_audit.event_type
range CHANGE_IDENTIFICATION .. SECURITY_ADMINISTRATION;

-- Pcte_audit.mandatory_event_type corresponds to the PCTE datatype
-- Mandatory_event_type.

type selected_return_code **is** (FAILURE, SUCCESS, ANY_CODE);

-- Pcte_audit.selected_return_code corresponds to the PCTE datatype
-- Selected_return_code.

subtype return_code **is** Pcte_audit.selected_return_code **range** FAILURE .. SUCCESS;

-- Pcte_audit.return_code corresponds to the PCTE datatype Return_code.

type audit_status **is** (ENABLED, DISABLED);

-- Pcte_audit.audit_status corresponds to the PCTE datatype Audit_status.

type general_criterion **is record**

 selectable_event_type : Pcte_audit.selectable_event_type;

 return_code : Pcte_audit.selected_return_code;

end record;

-- Pcte_audit.general_criterion corresponds to the PCTE datatype General_criterion.

-- The semantics of the operations of this package are defined in 8.2.8.

package general_criteria **is**

type sequence **is limited private**;

-- Pcte_audit.general_criteria.sequence corresponds to the PCTE datatype
 -- General_criteria.

function get (
 list : Pcte_audit.general_criteria.sequence;
 index : Pcte.natural := Pcte.natural'FIRST;
 status : Pcte_error.handle := EXCEPTION_ONLY)
 return Pcte_audit.general_criterion;

procedure insert (
 list : **in out** Pcte_audit.general_criteria.sequence;
 item : **in** Pcte_audit.general_criterion;
 index : **in** Pcte.natural := Pcte.natural'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure replace (
 list : **in out** Pcte_audit.general_criteria.sequence;
 item : **in** Pcte_audit.general_criterion;
 index : **in** Pcte.natural := Pcte.natural'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure append (
 list : **in out** Pcte_audit.general_criteria.sequence;
 item : **in** Pcte_audit.general_criterion;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure delete (
 list : **in out** Pcte_audit.general_criteria.sequence;
 index : **in** Pcte.natural := Pcte.natural'FIRST;
 count : **in** Pcte.positive := Pcte.positive'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure copy (
 into_list : **in out** Pcte_audit.general_criteria.sequence;
 from_list : **in** Pcte_audit.general_criteria.sequence;
 into_index : **in** Pcte.natural := Pcte.natural'LAST;
 from_index : **in** Pcte.natural := Pcte.natural'FIRST;
 count : **in** Pcte.positive := Pcte.positive'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

function length_of (
 list : Pcte_audit.general_criteria.sequence;
 status : Pcte_error.handle := EXCEPTION_ONLY)
 return Pcte.natural;

function index_of (
 list : Pcte_audit.general_criteria.sequence;
 item : Pcte_audit.general_criterion;
 status : Pcte_error.handle := EXCEPTION_ONLY)
 return Pcte.integer;


```

function are_equal (
    first      : Pcte_audit.general_criteria.sequence;
    second     : Pcte_audit.general_criteria.sequence;
    status     : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.boolean;

procedure normalize (
    list       : in out Pcte_audit.general_criteria.sequence;
    status     : in      Pcte_error.handle := EXCEPTION_ONLY);

procedure discard (
    list       : in out Pcte_audit.general_criteria.sequence;
    status     : in      Pcte_error.handle := EXCEPTION_ONLY);

private
    implementation-defined

end general_criteria;

type confidentiality_criterion
    (label_length : Pcte.string_length := 0)
is record
    selectable_event_type : Pcte_audit.selectable_event_type;
    security_label        : Pcte_mandatory.security_label(1..label_length);
end record;

-- Pcte_audit.confidentiality_criterion corresponds to the PCTE datatype
-- Confidentiality_criterion.

-- The semantics of the operations of this package are defined in 8.2.8.

package confidentiality_criteria is
    type sequence is limited private;
    -- Pcte_audit.confidentiality_criteria.sequence corresponds to the
    -- PCTE datatype Confidentiality_criteria.

    function get (
        list      : Pcte_audit.confidentiality_criteria.sequence;
        index     : Pcte.natural := Pcte.natural'FIRST;
        status    : Pcte_error.handle := EXCEPTION_ONLY)
        return    Pcte_audit.confidentiality_criterion;

    procedure insert (
        list      : in out Pcte_audit.confidentiality_criteria.sequence;
        item      : in      Pcte_audit.confidentiality_criterion;
        index     : in      Pcte.natural := Pcte.natural'LAST;
        status    : in      Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure replace (
    list      : in out    Pcte_audit.confidentiality_criteria.sequence;
    item      : in        Pcte_audit.confidentiality_criterion;
    index     : in        Pcte.natural := Pcte.natural'LAST;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

procedure append (
    list      : in out    Pcte_audit.confidentiality_criteria.sequence;
    item      : in        Pcte_audit.confidentiality_criterion;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

procedure delete (
    list      : in out    Pcte_audit.confidentiality_criteria.sequence;
    index     : in        Pcte.natural := Pcte.natural'FIRST;
    count     : in        Pcte.positive := Pcte.positive'LAST;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

procedure copy (
    into_list  : in out    Pcte_audit.confidentiality_criteria.sequence;
    from_list  : in        Pcte_audit.confidentiality_criteria.sequence;
    into_index : in        Pcte.natural := Pcte.natural'LAST;
    from_index : in        Pcte.natural := Pcte.natural'FIRST;
    count      : in        Pcte.positive := Pcte.positive'LAST;
    status     : in        Pcte_error.handle := EXCEPTION_ONLY);

function length_of (
    list      : Pcte_audit.confidentiality_criteria.sequence;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.natural;

function index_of (
    list      : Pcte_audit.confidentiality_criteria.sequence;
    item      : Pcte_audit.confidentiality_criterion;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.integer;

function are_equal (
    first     : Pcte_audit.confidentiality_criteria.sequence;
    second    : Pcte_audit.confidentiality_criteria.sequence;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.boolean;

procedure normalize (
    list      : in out    Pcte_audit.confidentiality_criteria.sequence;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

procedure discard (
    list      : in out    Pcte_audit.confidentiality_criteria.sequence;
    status    : in        Pcte_error.handle := EXCEPTION_ONLY);

```

private

implementation-defined

end confidentiality_criteria;

type integrity_criterion

(label_length : Pcte.string_length := 0)

is record

selectable_event_type : Pcte_audit.selectable_event_type;

security_label : Pcte_mandatory.security_label(1..label_length);

end record;

-- Pcte_audit.integrity_criterion corresponds to the PCTE datatype Integrity_criterion.

-- The semantics of the operations of this package are defined in 8.2.8.

package integrity_criteria **is**

type sequence **is limited private;**

-- Pcte_audit.integrity_criteria.sequence corresponds to the PCTE datatype

-- Integrity_criteria.

function get (

list : Pcte_audit.integrity_criteria.sequence;

index : Pcte.natural := Pcte.natural'FIRST;

status : Pcte_error.handle := EXCEPTION_ONLY)

return Pcte_audit.integrity_criterion;

procedure insert (

list : **in out** Pcte_audit.integrity_criteria.sequence;

item : **in** Pcte_audit.integrity_criterion;

index : **in** Pcte.natural := Pcte.natural'LAST;

status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure replace (

list : **in out** Pcte_audit.integrity_criteria.sequence;

item : **in** Pcte_audit.integrity_criterion;

index : **in** Pcte.natural := Pcte.natural'LAST;

status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure append (

list : **in out** Pcte_audit.integrity_criteria.sequence;

item : **in** Pcte_audit.integrity_criterion;

status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure delete (

list : **in out** Pcte_audit.integrity_criteria.sequence;

index : **in** Pcte.natural := Pcte.natural'FIRST;

count : **in** Pcte.positive := Pcte.positive'LAST;

status : **in** Pcte_error.handle := EXCEPTION_ONLY);

```

procedure copy (
    into_list      : in out    Pcte_audit.integrity_criteria.sequence;
    from_list      : in        Pcte_audit.integrity_criteria.sequence;
    into_index     : in        Pcte.natural := Pcte.natural'LAST;
    from_index     : in        Pcte.natural := Pcte.natural'FIRST;
    count          : in        Pcte.positive := Pcte.positive'LAST;
    status         : in        Pcte_error.handle := EXCEPTION_ONLY);

function length_of (
    list          : Pcte_audit.integrity_criteria.sequence;
    status        : Pcte_error.handle := EXCEPTION_ONLY)
    return        Pcte.natural;

function index_of (
    list          : Pcte_audit.integrity_criteria.sequence;
    item          : Pcte_audit.integrity_criteria.item;
    status        : Pcte_error.handle := EXCEPTION_ONLY)
    return        Pcte.integer;

function are_equal (
    first         : Pcte_audit.integrity_criteria.sequence;
    second        : Pcte_audit.integrity_criteria.sequence;
    status        : Pcte_error.handle := EXCEPTION_ONLY)
    return        Pcte.boolean;

procedure normalize (
    list          : in out    Pcte_audit.integrity_criteria.sequence;
    status        : in        Pcte_error.handle := EXCEPTION_ONLY);

procedure discard (
    list          : in out    Pcte_audit.integrity_criteria.sequence;
    status        : in        Pcte_error.handle := EXCEPTION_ONLY);

private
    implementation-defined
end integrity_criteria;

type object_criterion is record
    selectable_event_type : Pcte_audit.selectable_event_type;
    object_reference       : Pcte.object_reference;
end record;

-- Pcte_audit.object_criterion corresponds to the PCTE datatype Object_criterion.

-- The semantics of the operations of this package are defined in 8.2.8.

package object_criteria is
    type sequence is limited private;

```

```
-- Pcte_audit.object_criteria.sequence corresponds to the
-- PCTE datatype Object_criteria.
```

function get (

```
list      : Pcte_audit.object_criteria.sequence;
index     : Pcte.natural := Pcte.natural'FIRST;
status    : Pcte_error.handle := EXCEPTION_ONLY)
return    Pcte_audit.object_criterion;
```

procedure insert (

```
list      : in out Pcte_audit.object_criteria.sequence;
item      : in     Pcte_audit.object_criterion;
index     : in     Pcte.natural := Pcte.natural'LAST;
status    : in     Pcte_error.handle := EXCEPTION_ONLY);
```

procedure replace (

```
list      : in out Pcte_audit.object_criteria.sequence;
item      : in     Pcte_audit.object_criterion;
index     : in     Pcte.natural := Pcte.natural'LAST;
status    : in     Pcte_error.handle := EXCEPTION_ONLY);
```

procedure append (

```
list      : in out Pcte_audit.object_criteria.sequence;
item      : in     Pcte_audit.object_criterion;
status    : in     Pcte_error.handle := EXCEPTION_ONLY);
```

procedure delete (

```
list      : in out Pcte_audit.object_criteria.sequence;
index     : in     Pcte.natural := Pcte.natural'FIRST;
count     : in     Pcte.positive := Pcte.positive'LAST;
status    : in     Pcte_error.handle := EXCEPTION_ONLY);
```

procedure copy (

```
into_list : in out Pcte_audit.object_criteria.sequence;
from_list  : in     Pcte_audit.object_criteria.sequence;
into_index : in     Pcte.natural := Pcte.natural'LAST;
from_index : in     Pcte.natural := Pcte.natural'FIRST;
count      : in     Pcte.positive := Pcte.positive'LAST;
status     : in     Pcte_error.handle := EXCEPTION_ONLY);
```

function length_of (

```
list      : Pcte_audit.object_criteria.sequence;
status    : Pcte_error.handle := EXCEPTION_ONLY)
return    Pcte.natural;
```

function index_of (

```
list      : Pcte_audit.object_criteria.sequence;
item      : Pcte_audit.object_criterion;
status    : Pcte_error.handle := EXCEPTION_ONLY)
return    Pcte.integer;
```

```

function are_equal (
    first      : Pcte_audit.object_criteria.sequence;
    second     : Pcte_audit.object_criteria.sequence;
    status     : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.boolean;

procedure normalize (
    list       : in out Pcte_audit.object_criteria.sequence;
    status     : in     Pcte_error.handle := EXCEPTION_ONLY);

procedure discard (
    list       : in out Pcte_audit.object_criteria.sequence;
    status     : in     Pcte_error.handle := EXCEPTION_ONLY);

private
    implementation-defined

end object_criteria;

type user_criterion is record
    selectable_event_type : Pcte_audit.selectable_event_type;
    group                 : Pcte_discretionary.group_identifier;
end record;

-- Pcte_audit.user_criterion corresponds to the PCTE datatype User_criterion.

-- The semantics of the operations of this package are defined in 8.2.8.

package user_criteria is
    type sequence is limited private;
    -- Pcte_audit.user_criteria.sequence corresponds to the PCTE datatype User_criteria.

    function get (
        list      : Pcte_audit.user_criteria.sequence;
        index     : Pcte.natural := Pcte.natural'FIRST;
        status    : Pcte_error.handle := EXCEPTION_ONLY)
        return     Pcte_audit.user_criterion;

    procedure insert (
        list      : in out Pcte_audit.user_criteria.sequence;
        item      : in     Pcte_audit.user_criterion;
        index     : in     Pcte.natural := Pcte.natural'LAST;
        status    : in     Pcte_error.handle := EXCEPTION_ONLY);

    procedure replace (
        list      : in out Pcte_audit.user_criteria.sequence;
        item      : in     Pcte_audit.user_criterion;
        index     : in     Pcte.natural := Pcte.natural'LAST;
        status    : in     Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure append (
  list   : in out   Pcte_audit.user_criteria.sequence;
  item   : in        Pcte_audit.user_criterion;
  status : in        Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure delete (
  list   : in out   Pcte_audit.user_criteria.sequence;
  index  : in        Pcte.natural := Pcte.natural'FIRST;
  count  : in        Pcte.positive := Pcte.positive'LAST;
  status : in        Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure copy (
  into_list   : in out   Pcte_audit.user_criteria.sequence;
  from_list   : in        Pcte_audit.user_criteria.sequence;
  into_index  : in        Pcte.natural := Pcte.natural'LAST;
  from_index  : in        Pcte.natural := Pcte.natural'FIRST;
  count       : in        Pcte.positive := Pcte.positive'LAST;
  status      : in        Pcte_error.handle := EXCEPTION_ONLY);

```

```

function length_of (
  list       : Pcte_audit.user_criteria.sequence;
  status     : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.natural;

```

```

function index_of (
  list       : Pcte_audit.user_criteria.sequence;
  item       : Pcte_audit.user_criterion;
  status     : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.integer;

```

```

function are_equal (
  first      : Pcte_audit.user_criteria.sequence;
  second     : Pcte_audit.user_criteria.sequence;
  status     : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte.boolean;

```

```

procedure normalize (
  list   : in out   Pcte_audit.user_criteria.sequence;
  status : in        Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure discard (
  list   : in out   Pcte_audit.user_criteria.sequence;
  status : in        Pcte_error.handle := EXCEPTION_ONLY);

```

private

implementation-defined

end user_criteria;

21.2 Auditing operations

-- 21.2.1 AUDIT_ADD_CRITERION

-- AUDIT_ADD_CRITERION is mapped to the overloaded procedures
 -- Pcte_audit.add_criterion according to the type of the parameter *criterion*.

```
procedure add_criterion (
  station   : in    Pcte.object_reference;
  criterion : in    Pcte_audit.general_criterion;
  status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure add_criterion (
  station   : in    Pcte.object_reference;
  criterion : in    Pcte_audit.confidentiality_criterion;
  status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure add_criterion (
  station   : in    Pcte.object_reference;
  criterion : in    Pcte_audit.integrity_criterion;
  status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure add_criterion (
  station   : in    Pcte.object_reference;
  criterion : in    Pcte_audit.object_criterion;
  status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure add_criterion (
  station   : in    Pcte.object_reference;
  criterion : in    Pcte_audit.user_criterion;
  status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 21.2.2 AUDIT_FILE_COPY_AND_RESET

-- See below.

-- 21.2.3 AUDIT_FILE_READ

-- See below.

-- 21.2.4 AUDIT_GET_CRITERIA

-- AUDIT_GET_CRITERIA is mapped to the overloaded procedures Pcte_audit.get_criteria
 -- according to the type of the result *criteria*. The parameter *criterion_type* which determines
 -- the type of the result is omitted.

```
procedure get_criteria (
  station   : in    Pcte.object_reference;
  criteria   : in out Pcte_audit.general_criteria.sequence;
  status    : in    Pcte_error.handle := EXCEPTION_ONLY);
```



```
procedure get_criteria (
    station      : in      Pcte.object_reference;
    criteria     : in out  Pcte_audit.confidentiality_criteria.sequence;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure get_criteria (
    station      : in      Pcte.object_reference;
    criteria     : in out  Pcte_audit.integrity_criteria.sequence;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure get_criteria (
    station      : in      Pcte.object_reference;
    criteria     : in out  Pcte_audit.object_criteria.sequence;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure get_criteria (
    station      : in      Pcte.object_reference;
    criteria     : in out  Pcte_audit.user_criteria.sequence;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

-- 21.2.5 AUDIT_RECORD_WRITE

-- See below.

-- 21.2.6 AUDIT_REMOVE_CRITERION

-- AUDIT_REMOVE_CRITERION is mapped to the overloaded procedures
 -- Pcte_audit.remove_criterion according to the type of the parameter *criterion*.

```
procedure remove_criterion (
    station      : in      Pcte.object_reference;
    criterion    : in      Pcte_audit.selectable_event_type;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure remove_criterion (
    station      : in      Pcte.object_reference;
    criterion    : in      Pcte_audit.confidentiality_criterion;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure remove_criterion (
    station      : in      Pcte.object_reference;
    criterion    : in      Pcte_audit.integrity_criterion;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

```
procedure remove_criterion (
    station      : in      Pcte.object_reference;
    criterion    : in      Pcte_audit.object_criterion;
    status      : in      Pcte_error.handle := EXCEPTION_ONLY);
```

```

procedure remove_criterion (
    station    : in    Pcte.object_reference;
    criterion  : in    Pcte.audit.user_criterion;
    status     : in    Pcte_error.handle := EXCEPTION_ONLY);

```

package file is

```

type auditing_record (
    event_type : Pcte_audit.event_type := INFORMATION;
    id_1_length : Pcte.string_length := 0;
    id_2_length : Pcte.string_length := 0;
    id_3_length : Pcte.string_length := 0;
    id_4_length : Pcte.string_length := 0;
    text_length : Pcte.string_length := 0)
is record
    user          : Pcte_discretionary.group_identifier;
    time          : Pcte.calendar.time;
    workstation   : Pcte.exact_identifier (1 .. id_1_length);
    return_code   : Pcte_audit.return_code;
    process       : Pcte.exact_identifier (1 .. id_2_length);
case event_type is
    when EXPLOIT =>
        new_process      : Pcte.exact_identifier (1 .. id_3_length);
        exploited_object : Pcte.exact_identifier (1 .. id_4_length);
    when INFORMATION =>
        text : Pcte.string (1..text_length);
    when COPY | CHANGE_IDENTIFICATION =>
        source      : Pcte.exact_identifier (1 .. id_3_length);
        destination : Pcte.exact_identifier (1 .. id_4_length);
    when USE_PREDEFINED_GROUP | SET_USER_IDENTITY =>
        group : Pcte.exact_identifier (1 .. id_3_length);
    when others =>
        object : Pcte.exact_identifier (1 .. id_3_length);
end case;
end record;

```

```

-- Pcte_audit.file.auditing_record corresponds to the PCTE datatype Auditing_record,
-- which is a union type. Each of its component datatypes is mapped to the particular
-- constrained record type which has the discriminant event_type set to the
-- Pcte_audit.event_type value corresponding to that component.

```

-- The semantics of the operations of this package are defined in 8.2.8.

package auditing_records is

type sequence **is limited private;**

```

-- Pcte_audit.file.auditing_records.sequence corresponds to the PCTE datatype
-- Audit_file.

```

```

function get (
    list      : Pcte_audit.file.auditing_records.sequence;
    index     : Pcte.natural := Pcte.natural'FIRST;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return    Pcte_audit.file.auditing_record;

procedure insert (
    list      : in out Pcte_audit.file.auditing_records.sequence;
    item      : in     Pcte_audit.file.auditing_record;
    index     : in     Pcte.natural := Pcte.natural'LAST;
    status    : in     Pcte_error.handle := EXCEPTION_ONLY);

procedure replace (
    list      : in out Pcte_audit.file.auditing_records.sequence;
    item      : in     Pcte_audit.file.auditing_record;
    index     : in     Pcte.natural := Pcte.natural'LAST;
    status    : in     Pcte_error.handle := EXCEPTION_ONLY);

procedure append (
    list      : in out Pcte_audit.file.auditing_records.sequence;
    item      : in     Pcte_audit.file.auditing_record;
    status    : in     Pcte_error.handle := EXCEPTION_ONLY);

procedure delete (
    list      : in out Pcte_audit.file.auditing_records.sequence;
    index     : in     Pcte.natural := Pcte.natural'FIRST;
    count     : in     Pcte.positive := Pcte.positive'LAST;
    status    : in     Pcte_error.handle := EXCEPTION_ONLY);

procedure copy (
    into_list  : in out Pcte_audit.file.auditing_records.sequence;
    from_list  : in     Pcte_audit.file.auditing_records.sequence;
    into_index : in     Pcte.natural := Pcte.natural'LAST;
    from_index : in     Pcte.natural := Pcte.natural'FIRST;
    count      : in     Pcte.positive := Pcte.positive'LAST;
    status     : in     Pcte_error.handle := EXCEPTION_ONLY);

function length_of (
    list      : Pcte_audit.file.auditing_records.sequence;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return    Pcte.natural;

function index_of (
    list      : Pcte_audit.file.auditing_records.sequence;
    item      : Pcte_audit.file.auditing_record;
    status    : Pcte_error.handle := EXCEPTION_ONLY)
    return    Pcte.integer;

```

```

function are_equal (
    first      : Pcte_audit.file.auditing_records.sequence;
    second     : Pcte_audit.file.auditing_records.sequence;
    status     : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.boolean;

procedure normalize (
    list       : in out Pcte_audit.file.auditing_records.sequence;
    status     : in     Pcte_error.handle := EXCEPTION_ONLY);

procedure discard (
    list       : in out Pcte_audit.file.auditing_records.sequence;
    status     : in     Pcte_error.handle := EXCEPTION_ONLY);

private
    implementation-defined

end auditing_records;

-- 21.2.2 AUDIT_FILE_COPY_AND_RESET

procedure copy_and_reset (
    source      : in     Pcte.object_reference;
    destination : in     Pcte.object_reference;
    status      : in     Pcte_error.handle := EXCEPTION_ONLY);

-- 21.2.3 AUDIT_FILE_READ

procedure read (
    audit_file      : in     Pcte.object_reference;
    no_of_records   : in     Pcte.natural;
    records         : in out Pcte_audit.file.auditing_records.sequence;
    at_beginning    : in     Pcte.boolean := FALSE;
    status          : in     Pcte_error.handle := EXCEPTION_ONLY);

-- Pcte_audit.file.read reads no_of_records records or to the end of the audit file, the
-- whichever is fewer, from the current position in the audit file for the calling process.
-- The current position is incremented by the number of records read. If the parameter
-- at_beginning is set to TRUE, the current position in audit_file is first set to the
-- beginning of the audit file before reading.

-- 21.2.5 AUDIT_RECORD_WRITE

procedure write (
    text  : in     Pcte.string;
    status : in     Pcte_error.handle := EXCEPTION_ONLY);

end file;

```

-- 21.2.7 AUDIT_SELECTION_CLEAR

```
procedure clear_selection (
    station : in    Pcte.object_reference;
    status  : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 21.2.8 AUDIT_SWITCH_OFF_SELECTION

```
procedure switch_off_selection (
    station : in    Pcte.object_reference;
    status  : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 21.2.9 AUDIT_SWITCH_ON_SELECTION

```
procedure switch_on_selection (
    station : in    Pcte.object_reference;
    status  : in    Pcte_error.handle := EXCEPTION_ONLY);
```

-- 21.2.10 AUDITING_STATUS

```
function get_status (
    station : Pcte.object_reference;
    status  : Pcte_error.handle := EXCEPTION_ONLY)
return    Pcte_audit.audit_status;
```

end Pcte_audit;

22 Accounting

with Pcte, Pcte_error, Pcte_discretionary;

package Pcte_accounting **is**

use Pcte_error;

22.1 Accounting datatypes

type consumer_identifier **is new** Pcte.natural;

 -- Pcte_accounting.consumer_identifier corresponds to the PCTE datatype
 -- Consumer_identifier.

type resource_identifier **is new** Pcte.natural;

 -- Pcte_accounting.resource_identifier corresponds to the PCTE datatype
 -- Resource_identifier.

package log **is**

type operation **is** (SEND, RECEIVE);

type resource_kind **is** (WORKSTATION, STATIC_CONTEXT, SDS, DEVICE, FILE,
 PIPE, MESSAGE_QUEUE, INFORMATION);

```

type accounting_record (
    kind                : Pcte_accounting.log.resource_kind := INFORMATION;
    consumer_group_length : Pcte.string_length := 0;
    resource_group_length : Pcte.string_length := 0;
    information_length    : Pcte.string_length := 0)
is record
    security_user      : Pcte_discretionary.group_identifier;
    adopted_user_group : Pcte_discretionary.group_identifier;
    consumer_group     : Pcte.exact_identifier(1..consumer_group_length);
    resource_group     : Pcte.exact_identifier(1..resource_group_length);
    start_time        : Pcte.calendar.time;
    duration           : Pcte.float;
case kind is
    when WORKSTATION | STATIC_CONTEXT =>
        cpu_time      : Pcte.float;
        system_time   : Pcte.float;
    when FILE | PIPE | DEVICE =>
        read_count    : Pcte.natural;
        write_count    : Pcte.natural;
        read_size     : Pcte.natural;
        write_size     : Pcte.natural;
    when MESSAGE_QUEUE =>
        operation      : Pcte_accounting.log.operation;
        message_size   : Pcte.natural;
    when INFORMATION =>
        information    : Pcte.string(1..information_length);
    when SDS =>
        null;
    end case;
end record;

-- Pcte_accounting.log.accounting_record corresponds to the PCTE datatype
-- Accounting_record, which is a union type. Each of its component datatypes is
-- mapped to the particular constrained record type which has the discriminant kind set to
-- the Pcte_accounting.log.resource_kind value corresponding to that component.

-- The semantics of the operations of this package are defined in 8.2.8.

package accounting_records is
    type sequence is limited private;
    -- Pcte_accounting.log.accounting_records.sequence corresponds to the PCTE
    -- datatype Accounting_log.

```

function get (

list : Pcte_accounting.log.accounting_records.sequence;
 index : Pcte.natural := Pcte.natural'FIRST;
 status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte_accounting.log.accounting_record;

procedure insert (

list : **in out** Pcte_accounting.log.accounting_records.sequence;
 item : **in** Pcte_accounting.log.accounting_record;
 index : **in** Pcte.natural := Pcte.natural'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure replace (

list : **in out** Pcte_accounting.log.accounting_records.sequence;
 item : **in** Pcte_accounting.log.accounting_record;
 index : **in** Pcte.natural := Pcte.natural'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure append (

list : **in out** Pcte_accounting.log.accounting_records.sequence;
 item : **in** Pcte_accounting.log.accounting_record;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure delete (

list : **in out** Pcte_accounting.log.accounting_records.sequence;
 index : **in** Pcte.natural := Pcte.natural'FIRST;
 count : **in** Pcte.positive := Pcte.positive'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

procedure copy (

into_list : **in out** Pcte_accounting.log.accounting_records.sequence;
 from_list : **in** Pcte_accounting.log.accounting_records.sequence;
 into_index : **in** Pcte.natural := Pcte.natural'LAST;
 from_index : **in** Pcte.natural := Pcte.natural'FIRST;
 count : **in** Pcte.positive := Pcte.positive'LAST;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

function length_of (

list : Pcte_accounting.log.accounting_records.sequence;
 status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte.natural;

function index_of (

list : Pcte_accounting.log.accounting_records.sequence;
 item : Pcte_accounting.log.accounting_record;
 status : Pcte_error.handle := EXCEPTION_ONLY)
return Pcte.integer;

```

function are_equal (
    first      : Pcte_accounting.log.accounting_records.sequence;
    second     : Pcte_accounting.log.accounting_records.sequence;
    status     : Pcte_error.handle := EXCEPTION_ONLY)
    return     Pcte.boolean;

procedure normalize (
    list       : in out Pcte_accounting.log.accounting_records.sequence;
    status     : in     Pcte_error.handle := EXCEPTION_ONLY);

procedure discard (
    list       : in out Pcte_accounting.log.accounting_records.sequence;
    status     : in     Pcte_error.handle := EXCEPTION_ONLY);

private
    implementation-defined

end accounting_records;

```

22.2 Accounting operations

-- 22.2.1 ACCOUNTING_LOG_COPY_AND_RESET

```

procedure copy_and_reset (
    source_log      : in     Pcte.object_reference;
    destination_log : in     Pcte.object_reference;
    status          : in     Pcte_error.handle := EXCEPTION_ONLY);

```

-- 22.2.2 ACCOUNTING_LOG_READ

```

procedure read (
    log           : in         Pcte.object_reference;
    no_of_records : in         Pcte.natural;
    records       : in out    Pcte_accounting.log.accounting_records.sequence;
    at_beginning  : in         Pcte.boolean := FALSE;
    status        : in         Pcte_error.handle := EXCEPTION_ONLY);

```

-- Pcte_accounting.log.read reads *no_of_records* records or to the end of the accounting log, whichever is fewer, from the current position in the accounting log for the calling process. The current position is incremented by the number of records read. If the parameter *at_beginning* is set to TRUE, the current position in *log* is first set to the beginning of the accounting log before reading.

-- 22.2.3 ACCOUNTING_OFF

-- See below.

-- 22.2.4 ACCOUNTING_ON

-- See below.

-- 22.2.5 ACCOUNTING_RECORD_WRITE

```

procedure write (
    log           : in    Pcte.object_reference;
    information    : in    Pcte.string;
    status        : in    Pcte_error.handle := EXCEPTION_ONLY);

```

end log;

-- 22.2.3 ACCOUNTING_OFF

```

procedure off (
    station : in    Pcte.object_reference;
    status  : in    Pcte_error.handle := EXCEPTION_ONLY);

```

-- 22.2.4 ACCOUNTING_ON

```

procedure on (
    log      : in    Pcte.object_reference;
    station  : in    Pcte.object_reference;
    status   : in    Pcte_error.handle := EXCEPTION_ONLY);

```

package consumer_group **is**

-- 22.2.6 CONSUMER_GROUP_INITIALIZE

```

function initialize (
    group      : Pcte.object_reference;
    status     : Pcte_error.handle := EXCEPTION_ONLY)
    return      Pcte_accounting.consumer_identifier;

```

-- 22.2.7 CONSUMER_GROUP_REMOVE

```

procedure remove (
    group : in    Pcte.object_reference;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);

```

end consumer_group;

package resource_group **is**

-- 22.2.8 RESOURCE_GROUP_ADD_OBJECT

```

procedure add_object (
    object : in    Pcte.object_reference;
    group  : in    Pcte.object_reference;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);

```

-- 22.2.9 RESOURCE_GROUP_REMOVE

```

procedure remove (
    group : in    Pcte.object_reference;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);

```

-- 22.2.10 RESOURCE_GROUP_INITIALIZE

```
function initialize (
    group      : Pcte.object_reference;
    status     : Pcte_error.handle := EXCEPTION_ONLY)
return      Pcte_accounting.resource_identifier;
```

-- 22.2.11 RESOURCE_GROUP_REMOVE_OBJECT

```
procedure remove_object (
    object : in    Pcte.object_reference;
    group  : in    Pcte.object_reference;
    status : in    Pcte_error.handle := EXCEPTION_ONLY);
```

end resource_group;

end Pcte_accounting;

22.3 Consumer identity operations

-- See 13.3.

23 References

-- See 8.4.

24 Limits

with Pcte, Pcte_error;

package Pcte_limit **is**

use Pcte_error;

type limit **is** (MAX_ACCESS_CONTROL_LIST_LENGTH,
 MAX_ACCOUNT_DURATION, DELTA_ACCOUNT_DURATION,
 MAX_ACCOUNT_INFORMATION_LENGTH,
 MAX_ACTIVITIES,
 MAX_ACTIVITIES_PER_PROCESS,
 MAX_AUDIT_INFORMATION_LENGTH,
 MAX_DIGIT_FLOAT_ATTRIBUTE,
 MAX_FILE_SIZE,
 MAX_FLOAT_ATTRIBUTE, MIN_FLOAT_ATTRIBUTE,
 MAX_INTEGER_ATTRIBUTE, MIN_INTEGER_ATTRIBUTE,
 MAX_KEY_SIZE,
 MAX_KEY_VALUE,
 MAX_LINK_REFERENCE_SIZE,
 MAX_MESSAGE_QUEUE_SPACE,
 MAX_MESSAGE_SIZE,
 MAX_MOUNTED_VOLUMES,
 MAX_NAME_SIZE,
 MAX_NATURAL_ATTRIBUTE,
 MAX_OPEN_OBJECTS,
 MAX_OPEN_OBJECTS_PER_PROCESS,
 MAX_PIPE_SIZE,
 MAX_PRIORITY_VALUE,
 MAX_PROCESSES,
 MAX_PROCESSES_PER_USER,
 MAX_SDS_IN_WORKING_SCHEMA,
 MAX_SECURITY_GROUPS,
 MAX_STRING_ATTRIBUTE_SIZE,
 MAX_TIME_ATTRIBUTE, MIN_TIME_ATTRIBUTE,
 SMALLEST_FLOAT_ATTRIBUTE);

type category **is** (STANDARD_LIMIT, IMPLEMENTATION_LIMIT,
 REMAINING_LIMIT);

-- Pcte_limit.category indicates to the procedure get_value the category of limit value
 -- required. STANDARD_LIMIT indicates the limit bounds given in ISO/IEC 13719-1,
 -- clause 24; IMPLEMENTATION_LIMIT indicates the limits imposed by the
 -- implementation; and REMAINING_LIMIT indicates the current available quantity of the
 -- resource concerned.

procedure get_value (
 value : **in** Pcte_limit.limit;
 result : **out** Pcte.integer;
 unlimited : **out** Pcte.boolean;
 category : **in** Pcte_limit.category := STANDARD_LIMIT;
 status : **in** Pcte_error.handle := EXCEPTION_ONLY);

```

procedure get_value (
    value      : in    Pcte_limit.limit;
    result     : out   Pcte.float;
    unlimited  : out   Pcte.boolean;
    category   : in    Pcte_limit.category := STANDARD_LIMIT;
    status     : in    Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure get_value (
    value      : in    Pcte_limit.limit;
    result     : out   Pcte.calendar.time;
    unlimited  : out   Pcte.boolean;
    category   : in    Pcte_limit.category := STANDARD_LIMIT;
    status     : in    Pcte_error.handle := EXCEPTION_ONLY);

```

```

procedure get_value (
    value      : in    Pcte_limit.limit;
    result     : out   STANDARD.DURATION;
    unlimited  : out   Pcte.boolean;
    category   : in    Pcte_limit.category := STANDARD_LIMIT;
    status     : in    Pcte_error.handle := EXCEPTION_ONLY);

```

-- Pcte_limit.get_value returns the value of the limit *value* according to the value of
 -- *category*. The second overloaded procedure is used for MAX_FLOAT_ATTRIBUTE,
 -- MIN_FLOAT_ATTRIBUTE, and SMALLEST_FLOAT_ATTRIBUTE; the third
 -- overloaded procedure is used for MAX_TIME_ATTRIBUTE and
 -- MIN_TIME_ATTRIBUTE; the fourth overloaded procedure is used for
 -- MAX_ACCOUNT_DURATION and DELTA_ACCOUNT_DURATION; and the first
 -- overloaded procedure is used for the rest.

end Pcte_limit;

25 Errors

package Pcte_error **is**

type handle **is limited private**;

-- Pcte_error.handle is the type of the parameter status of mode **in** which most subprograms
 -- have. An error handle has two associated properties, called record and raise. If record is
 -- set and an error condition occurs, the enumeration value indicating the error condition is
 -- recorded in the error handle and may be interrogated. If raise is set and an error condition
 -- occurs, an exception is raised. Both record and raise may be set. Error handles are
 -- initialized to EXCEPTION_ONLY.

EXCEPTION_ONLY : **constant** Pcte_error.handle;

-- EXCEPTION_ONLY is a value of an error handle which has raise set, record unset, and
 -- has recorded error condition NO_ERROR.

-----	PCTE exceptions	-----
--	The error conditions defined in ISO/IEC 13719-1, annex C, and error conditions defined in this binding, are divided into a number of sets, each corresponding to an exception.	
--	The exception which may be raised by each error condition is shown by a code letter against the error condition name in the list below. The exceptions, their code letters, and descriptions of the general nature of the corresponding error conditions are as follows.	
	ERROR_WITH_USAGE : exception;	-- U
--	indicates that the intended usage of PCTE is an error.	
	ERROR_WITH_STATE : exception;	-- S
--	indicates that the call is an error in the context of the state of the object base.	
	ERROR_WITH_IDENTIFICATION : exception;	-- I
--	indicates that the parameters fail to identify a valid entity of the intended kind.	
	ERROR_WITH_PARAMETER : exception;	-- P
--	indicates a fundamental error in the values of one or more parameters, such that the call could not be valid under any circumstances	
	ERROR_WITH_DEVICE : exception;	-- D
--	indicates that there is a problem with the use of a device or a volume.	
	ERROR_WITH_NETWORK : exception;	-- N
--	indicates that there is a problem with access over the network.	
	ERROR_FROM_INTERRUPTED : exception;	-- R
--	indicates that the operation has been interrupted.	
	ERROR_FROM_TIMEOUT : exception;	-- T
--	indicates that the operation has been timed out.	
	ERROR_WITH_TIME : exception;	
--	indicates that there is a problem in the use of the operations "time_of", "+" or "-" of the package Pcte.calendar for the same reasons as defined by TIME_ERROR in the package CALENDAR.	

-----	PCTE ERROR CODES	-----
type error_code is (		
NO_ERROR,		
-- Errors defined in ISO/IEC 13719-1:		
Corresponding Exceptions:		
ACCESS_CONTROL_WOULD_NOT_BE_GRANTED,		-- U
ACCESS_MODE_IS_INCOMPATIBLE,		-- P
ACCESS_MODE_IS_NOT_ALLOWED,		-- S

ACCOUNTING_LOG_IS_NOT_ACTIVE, -- U
ACTIVITY_IS_OPERATING_ON_A_RESOURCE, -- S
ACTIVITY_STATUS_IS_INVALID, -- S
ACTIVITY_WAS_NOT_STARTED_BY_CALLING_PROCESS, -- U
ARCHIVE_EXISTS, -- U
ARCHIVE_HAS_ARCHIVED_OBJECTS, -- U
ARCHIVE_IS_INVALID_ON_DEVICE, -- U
ARCHIVE_IS_UNKNOWN, -- S
ATOMIC_ACL_IS_INCOMPATIBLE_WITH_OWNER_CHANGE, -- S
ATTRIBUTE_TYPE_IS_NOT_VISIBLE, -- I
ATTRIBUTE_TYPE_OF_LINK_TYPE_IS_NOT_APPLIED, -- U
ATTRIBUTE_TYPE_OF_OBJECT_TYPE_IS_NOT_APPLIED, -- U
AUDIT_FILE_IS_NOT_ACTIVE, -- U
BREAKPOINT_IS_NOT_DEFINED, -- I
CARDINALITY_IS_INVALID, -- U
CATEGORY_IS_BAD, -- P
CLASS_NAME_IS_INVALID, -- P
CONFIDENTIALITY_CONFINEMENT_WOULD_BE_VIOLATED, -- S
CONFIDENTIALITY_CRITERION_IS_NOT_SELECTED, -- U
CONFIDENTIALITY_LABEL_IS_INVALID, -- P
CONFIDENTIALITY_WOULD_BE_VIOLATED, -- S
CONNECTION_IS_DENIED, -- N
CONSUMER_GROUP_IS_IN_USE, -- S
CONSUMER_GROUP_IS_KNOWN, -- S
CONSUMER_GROUP_IS_UNKNOWN, -- I
CONTENTS_IS_NOT_EMPTY, -- S
CONTENTS_IS_NOT_FILE_CONTENTS, -- U
CONTENTS_IS_NOT_OPEN, -- S
CONTENTS_OPERATION_IS_INVALID, -- S
CONTROL_WOULD_NOT_BE_GRANTED, -- U
DATA_ARE_NOT_AVAILABLE, -- S
DEFAULT_ACL_WOULD_BE_INCONSISTENT_WITH_DEFAULT_OBJECT_OWNER, -- U
DEFAULT_ACL_WOULD_BE_INVALID, -- U
DEFINITION_MODE_VALUE_WOULD_BE_INVALID, -- U
DESTINATION_OBJECT_TYPE_IS_INVALID, -- I
DEVICE_CHARACTERISTICS_ARE_INVALID, -- D
DEVICE_CONTROL_OPERATION_IS_INVALID, -- D
DEVICE_EXISTS, -- U
DEVICE_IS_BUSY, -- D
DEVICE_IS_IN_USE, -- D
DEVICE_IS_UNKNOWN, -- I
DEVICE_LIMIT_WOULD_BE_EXCEEDED, -- D
DEVICE_SPACE_IS_FULL, -- D
DISCRETIONARY_ACCESS_IS_NOT_GRANTED, -- S
ENUMERAL_TYPE_IS_INVALID, -- P
ENUMERAL_TYPE_IS_NOT_IN_ATTRIBUTE_VALUE_TYPE, -- P
ENUMERAL_TYPE_IS_NOT_VISIBLE, -- I