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**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*



Reference number  
ISO/IEC 13719-3:1995(E)

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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 the European Computer Manufacturers Association (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.

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*

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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 clauses 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 13719-1:1995, *Information technology — Portable Common Tool Environment (PCTE) — Part 1: Abstract specification.*

ISO/IEC 13719-2:1995, *Information technology — Portable Common Tool Environment (PCTE) — Part 2: C programming language binding.*

- ISO/IEC 11404 : —<sup>1)</sup>, *Information technology — Programming languages, their environments and system software interfaces — Language-independent datatypes.*
- ISO/IEC TR 10182 : 1993, *Information technology — Programming languages, their environments and system software interfaces — Guidelines for language bindings.*
- ISO/IEC 8652:1995, *Information technology — Programming languages — Ada (referring to ANSI-MIL-STD 1815A — Reference Manual for the Ada Programming Language).*

## 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.

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.

## 7 Binding strategy

### 7.1 Ada programming language standard

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

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1) To be published.

## 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, 'VERSION\_ADD\_PREDECESSOR' is mapped to 'Pcte\_version.add\_predecessor'

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 DIS11404.

## 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 (x,y)	$x = y$
Not (x)	<b>not</b> x
And (x,y)	x <b>and</b> y
Or (x,y)	x <b>or</b> y

**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\_xxxx (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)	<b>for</b> i <b>in</b> xxx <b>loop</b> <b>if</b> s1(i) <b>and not</b> s2(i) <b>then</b> <b>return</b> FALSE; <b>end if</b> ; <b>end loop</b> ; <b>return</b> TRUE;
Equal (s1,s2)	s1 = s2
Difference (s1, s2)	s1 <b>and not</b> s2
Union (s1,s2)	s1 <b>or</b> s2
Intersection (s1,s2)	s1 <b>and</b> s2
Empty ()	xxxs'(others => FALSE)
SetOf (e)	xxxs'(e => TRUE, others => FALSE)
Select (s)	j : xxx; <b>for</b> i <b>in</b> xxx <b>loop</b> j := i; <b>exit when</b> s(j); <b>end loop</b> ; <b>return</b> 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** 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** 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 (
  object : 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.

-- 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\_references.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);
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_references.sequence;
  children      : Pcte.type_references.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_reference;
  object_type : in Pcte.type_reference;
  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_reference;
  pcte_type     : in      Pcte.type_reference;
  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_reference;
  object_type   : in      Pcte.type_reference;
  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_reference;
  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_references.sequence;
  new_type      : in out  Pcte.type_reference;
  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_reference;
  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_references.sequence;
  new_type      : in out  Pcte.type_reference;
  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_reference;
  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_reference;
  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_reference;
  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_references.sequence;
  new_type     : in out  Pcte.type_reference;
  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_reference;
  new_reverse_type  : in out  Pcte.type_reference;
  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_reference;
  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_reference;
  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_reference;
  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_reference;
  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_reference;
  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_reference;
  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_reference;
  object_type   : in   Pcte.type_reference;
  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_reference;
  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_reference;
  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_reference;
  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_reference;
  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_reference;
  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_reference;
  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_reference;
  pcte_type     : in    Pcte.type_reference;
  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_reference;
  object_type  : in    Pcte.type_reference;
  status       : in    Pcte_error.handle := EXCEPTION_ONLY);

```

**10.3 Usage operations**

## -- 10.3.1 SDS\_GET\_ATTRIBUTE\_TYPE\_PROPERTIES

```

procedure get_attribute_type_properties (
  sds          : in    Pcte.object_reference;
  pcte_type    : in    Pcte.type_reference;
  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_reference;
  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_reference;
  type2        : Pcte.type_reference;
  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_reference;
  properties   : in out Pcte_sds.link_type_properties;
  pcte_reverse : in out Pcte.type_reference;
  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_reference;
  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_reference;
  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_reference;
  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_reference;
  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_reference;
  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_reference;
  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_reference;
  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_reference;
  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);
  end package volume_infos;
end package Pcte_volume;

```

```

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;

## 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;

### 17.2 Replication datatypes

-- None.

### 17.3 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   : in    Pcte.object_reference := LOCAL_WORKSTATION;
    status    : in    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
  --   datatypeAcl.

  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_criteria.sequence;
  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.criterion;
  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.

```