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Defect Reports Part 2
for
ISO/IEC 8652:1995
Programming Languages—Ada

Programming languages — Ada

DEFECT REPORTS

Part 2

For ISO/IEC 8652:1995

September 2000

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Introduction

This document contains defect reports on the Ada 95 standard [ISO/IEC 8652:1995], and responses formulated by the Ada Rapporteur Group (ARG) of ISO/IEC JTC 1/SC 22/WG 9, the Ada working group. The ARG is the language maintenance subgroup of WG 9, meaning that it is responsible for determining the corrections to the standard.

Defect Reports usually come from comments submitted by the public to the ARG. These comments are distilled into a question, given in the **Question** section of the Defect Report response.

In order to formulate the response to the Defect Report, the question is carefully considered and often discussed at length by the ARG. The results are recorded in the **Discussion** section of the response. The answer to the question arrived at after the discussions is summarized in the **Summary of Response** section. A more detailed answer to the question can be found in the **Response** section. Sometimes, the issue is so obvious that there is no **Response** or **Discussion** section. If the result of the discussion finds that some change to the standard would be required to arrive at an answer to the question, a **Corrigendum Wording** section includes the specific wording change to standard. These **Corrigendum Wording** sections are gathered together in a Technical Corrigendum document.

A Defect Report and Response is the final step of a lengthy process of formulation, discussion, and approval. The working documents of the ARG (called Ada Issues) contain additional information about the issue and its resolution. Ada Issues may include sections for testing information (**ACATS test**), informal wording changes (**Wording**), and an appendix including E-Mail comments on this issue (**Appendix**). These sections are not included in the Defect Reports found in this document. This information is available in the Ada Issues documents, which can be accessed on the web at www.ada-auth.org/~acats/arg.

The Defect Reports and Responses contain many references of the form ss.cc(pp) or ss.cc.aa(pp). These refer to particular paragraphs in the standard, with the notation referencing the (sub)clause number in the Ada 95 standard (ss.cc.aa), followed by a parenthesized paragraph number (pp). Paragraphs are numbered by counting from the top of the (sub)clause, ignoring headings.

The Defect Reports and Responses contain references to the Annotated Ada Reference Manual (AARM). This document contains all of the text in the Ada 95 standard along with various annotations. It was prepared by the Ada 95 design team, and is intended primarily for compiler writers, test writers, and the ARG. The annotations include rationale for some rules. The AARM is often used by the ARG to determine the intent of the language designers.

The Defect Reports and Responses may contain references to Ada 83. Ada 83 is the common name for the previous version of the Ada standard, ISO/IEC 8652:1987. Similarly, AI83 refers to interpretations of that standard.

This document contains all of the Defect Reports contained in Ada Records of Response 1. Issues which resulted in wording changes to the standard are available in the companion document, Defect Reports Part 1. Resolutions of newer issues can be found on the web site mentioned previously.

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PART 1 - TO BE COMPLETED BY WG SECRETARIAT
DEFECT REPORT NUMBER: 8652/0094
WG SECRETARIAT: James W. Moore, Convener, ISO/IEC JTC 1/SC 22/WG 9
DATE CIRCULATED BY WG SECRETARIAT: 2000/08/01
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PART 2 - TO BE COMPLETED BY SUBMITTER
SUBMITTER: Erhard Ploedereder and Randall Brukardt, Ada Project Editors
FOR REVIEW BY: ISO/IEC JTC 1/SC 22/WG 9
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QUALIFIER: Clarification requested
REFERENCES IN DOCUMENT: 1.1.3
NATURE OF DEFECT (complete, concise explanation of the perceived problem): See Question on next page.
SOLUTION PROPOSED BY THE SUBMITTER (optional): See Summary of Response on next page.

PART 3 - EDITOR'S RESPONSE
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8652/0094 Is normal termination an "external interaction"?

Working Reference Number AI95-00119

Question

Is the normal termination of a program with no function result or parameters an external interaction? (Yes.) It isn't defined as one in 1.1.3(9-14).

In particular, the following main program has no external interactions as defined in 1.1.3:

```
procedure Main is
begin
  loop
    null;
  end loop;
end Main;
```

May an implementation optimize out the infinite loop? (No.) The resulting program also has no external interactions; the only difference is that it terminates.

Summary of Response

Termination of a program is considered an external interaction.

Response

1.1.3 (12) includes as an external interaction:

Any result returned or exception propagated from a main subprogram (see 10.2) or an exported subprogram (see Annex B) to an external caller.

10.2 (2) says that a main subprogram "can be invoked from outside the Ada implementation". A.15 goes on to describe the possible interactions of a main subprogram with the "external execution environment", including the possibility that a main subprogram may return a status value. In particular "Normal termination of a program returns as the exit status ...".

The above wording must be understood as an attempt to define in Ada terminology ("invoked", "result returned", and "exception propagated") interactions with an external execution environment that is not itself governed by the standard.

The International Standard does not (and cannot) define the exact manner of invocation of a main subprogram by the external execution environment, how parameters may be passed to it (if any), how the main program may return status, or what activities in the external environment may be triggered by termination of the main program (whether normal or abnormal). Therefore, unless a given implementation can determine that a specific external environment will not be affected by whether a given program terminates, the Ada implementation must assume that it might.

Even within the Ada domain, elimination of an infinite loop from a subprogram is not an acceptable optimization. For example, consider the following:

```
procedure External_Environment is
  procedure Main is
  begin
    loop
      null;
    end loop;
  end Main;
begin
  Main;
```

```
    Explode_The_Bomb;  
end External_Environment;
```

No one would argue that it would be acceptable to delete the infinite loop above, assuming that Explode_The_Bomb has some "external interaction" as the name suggests. By analogy, there is no reason to presume that the external environment from which an Ada program is invoked is not capable of expressing a dependence such as the one above.

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PART 1 - TO BE COMPLETED BY WG SECRETARIAT
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WG SECRETARIAT: James W. Moore, Convener, ISO/IEC JTC 1/SC 22/WG 9
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8652/0095 Unconstrained formal types**Working Reference Number AI95-00034****Question**

When is a generic formal subtype unconstrained?

AARM 12.3(11.c) says:

A formal derived subtype is constrained if and only if the ancestor subtype is constrained. A formal array type is constrained if and only if the declarations says so. Other formal subtypes are unconstrained, even though they might be constrained in an instance.

However, this does not seem to follow from the rules in the standard.

Summary of Response

A formal private subtype without discriminants is constrained.

An access subtype may be doubly constrained in a generic instance; the constraint given in the subtype_indication overrides the constraint (if any) that might have come from the actual subtype.

Response

3.2(9) says:

A subtype is called an unconstrained subtype if its type has unknown discriminants, or if its type allows range, index, or discriminant constraints, but the subtype does not impose such a constraint; otherwise, the subtype is called a constrained subtype (since it has no unconstrained characteristics).

Note the distinction between "type" and "subtype". An array type allows an index constraint, for example, whereas an array subtype may or may not impose one.

Thus, AARM 12.3(11.c) is incorrect in the case of a subtype of a formal private type with no discriminants. Such a subtype is constrained, because its type does not allow a discriminant constraint.

This raises an interesting question:

```

generic
  type Str_Ptr is access String;
package GP is
  ...
end GP;

package body GP is
  subtype Str_Ptr_10 is Str_Ptr(1..10); -- Legal? (Yes.)
  X : Str_Ptr_10;
  ...
end GP;

```

Str_Ptr is unconstrained, since an access type designating String allows a constraint, and Str_Ptr does not impose one. This implies that 3.7.1(7) allows the subtype_indication "Str_Ptr(1..10)". However, the instance might try to impose a different constraint:

```

type Str_P is access String;
subtype Str_P_7 is Str_P(1..7);

package P is new GP(Str_P_7); -- Legal? (Yes.)

```

12.3(11) says this is legal, since Legality Rules are not enforced in the body of an instance. Thus, the bounds of X are (1..10), and the constraint (1..7) is effectively ignored.

Note that if the declaration of Str_Ptr_10 were in the declaration of GP instead of the body, then the instantiation P would be illegal, since Legality Rules are enforced in the instance declaration.

Note that if the two constraints ever "meet", Constraint_Error will be raised, as illustrated by the following modification of the above example:

```

generic
  type Str_Ptr is access String;
  Obj: in out Str_Ptr;
package GP is
  procedure Bad;
end GP;

package body GP is
  subtype Str_Ptr_10 is Str_Ptr(1..10);
  S: aliased String(1..10);
  X: Str_Ptr_10 := S'access;

  procedure Bad is
  begin
    Obj := X; -- Constraint_Error is raised here.
  end Bad;
end GP;

type Str_P is access String;
subtype Str_P_7 is Str_P(1..7);
Actual_Obj: Str_P_7;

package P is new GP(Str_P_7, Actual_Obj);
...
P.Bad; -- This will propagate Constraint_Error.

```

In the instance, Obj is constrained to (1..7), whereas X is constrained to (1..10). An attempt to assign one to the other (as in procedure Bad) will fail the constraint check.

An alternative rule would be that it is illegal to give a constrained access subtype as the actual in the above case. This would be a cleaner rule, since it would avoid the anomaly of a doubly-constrained access type. However, most Ada 83 compilers probably allow the above example, and make the bounds of X be (1..10), and since constraining an access subtype is fairly uncommon, it does not seem worthwhile to use this alternative rule.

Note that it is irrelevant whether a formal scalar subtype is considered constrained or unconstrained, since no compile-time rules are affected. Constrained-ness of a scalar type has an effect at run-time, but at run-time, only instances exist, not generic units.

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SOLUTION PROPOSED BY THE SUBMITTER (optional): See Summary of Response on next page.

PART 3 - EDITOR'S RESPONSE
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8652/0096 Case sensitivity of Wide_Value and Value attributes

Working Reference Number AI95-00053

Question

For S'Wide_Value in the case of a nongraphic character, 3.5(43) gives the following condition under which the normal result is returned; otherwise, Constraint_Error is raised: "...if the sequence of characters of the parameter (ignoring leading and trailing spaces) has the syntax of an enumeration literal and if it ... corresponds to the result of S'Wide_Image for a nongraphic character of the type..."

Is the use of the term "corresponds" intended to imply case sensitivity? (No.)

Summary of Response

S'Wide_Value and S'Value are not case sensitive for nongraphic characters.

Response

A sequence of characters corresponds to the result of S'Wide_Image if it is the same ignoring case. Thus, S'Wide_Value is not case sensitive in the case of a nongraphic character. The same applies to S'Value.

It is clearly the intent that the "correspondence" mentioned above be case insensitive. Thus, Character'Wide_Value("nul") does not raise Constraint_Error, even though Character'Wide_Image returns "NUL" for the nul character.

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REFERENCES IN DOCUMENT: 3.9.1; 7.6; A
NATURE OF DEFECT (complete, concise explanation of the perceived problem): See Question on next page.
SOLUTION PROPOSED BY THE SUBMITTER (optional): See Summary of Response on next page.

PART 3 - EDITOR'S RESPONSE
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8652/0097 Controlled types in language-defined generic packages

Working Reference Number AI95-00115

Question

May an implementation declare a controlled type in its implementation of a language-defined generic package? (No.) For example, may `Ada.Sequential_IO.File_Type` be a controlled type? (No.)

Summary of Response

A language-defined generic package may be instantiated at any nesting depth. Hence, it cannot declare a controlled type.

Response

A language-defined generic package may be instantiated at any nesting depth. This follows from the fact that the standard does not say otherwise.

This implies that the implementation of a language-defined generic package cannot contain the declaration of a controlled type, since the accessibility rules require that controlled types be declared at library level.

If an implementation wishes to implement, say, `Ada.Sequential_IO.File_Type` in terms of a controlled type, it can declare the controlled type in a separate (non-generic) package, such as `System.File_Implementation`, and make type `File_Type` have a component whose type is the controlled type.

The implementation model given in AARM A.5.2(46.a), which calls for making the `Generator` type of the random number packages a controlled type, is wrong. It should instead call for `Generator` to have a component of a controlled type, declared in a (non-generic) package.

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PART 2 - TO BE COMPLETED BY SUBMITTER
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QUALIFIER: Clarification requested
REFERENCES IN DOCUMENT: 3.9.2
NATURE OF DEFECT (complete, concise explanation of the perceived problem): See Question on next page.
SOLUTION PROPOSED BY THE SUBMITTER (optional): See Summary of Response on next page.

PART 3 - EDITOR'S RESPONSE
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8652/0098 Primitive operations declared before it is known if the type is tagged

Working Reference Number AI95-00183

Question

Is a primitive operation of a type which is declared before it is known that the type is tagged a dispatching operation? (Yes.)

This question matters because 3.9.2(12) states that "A given subprogram shall not be a dispatching operation of two or more distinct tagged types."

Consider the following examples:

```
package P1 is
  type T1 is private;
  type T2 is private;
  procedure P (X1 : T1; X2 : T2); -- violates 3.9.2(12) ? (Yes.)
private
  type T1 is tagged null record;
  type T2 is tagged null record;
end;

package P2 is
private
  type T1;
  type T2;
  procedure P (X1 : access T1; X2 : access T2);
  -- violates 3.9.2(12) ? (Yes.)
end;

package body P2 is
  type T1 is tagged null record;
  type T2 is tagged null record;
end;
```

Summary of Response

Consider a type whose partial view is untagged, but whose full view is tagged. A primitive subprogram declared for the partial view is a dispatching subprogram of the full view.

Therefore, if there are two types, T1 and T2, and there is a primitive subprogram of both:

```
procedure Primitive(X: T1; Y: T2);
```

then it is illegal for both T1 and T2 to be tagged, even if the full type declarations occur after Primitive.

DEFECT REPORT

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NATURE OF DEFECT (complete, concise explanation of the perceived problem): See Question on next page.
SOLUTION PROPOSED BY THE SUBMITTER (optional): See Summary of Response on next page.

PART 3 - EDITOR'S RESPONSE
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8652/0099 Operators not inherited from root numeric types

Working Reference Number AI95-00152

Question

Consider the operators described in 4.5.5(17), such as

```
function "*" (Left: root_real; Right: root_integer) return root_real;
```

It would seem logical to assume that `root_real` is declared immediately within the visible part of package `Standard`, which means that this operator is a primitive subprogram of type `root_real`.

By 3.5.6(3), `Float` is derived from `root_real`. Does `Float` therefore inherit this operator? (No.) If so, the following function exists:

```
function "*" (Left: Float; Right: root_integer) return Float;
```

which would make the following legal:

```
declare
  X: Float;
begin
  ...
  X := X * 2; -- Legal? (No.)
end;
```

The same applies to a user-defined numeric type.

Summary of Response

Predefined operators, including those of the root numeric types, are not inherited. Instead, types have predefined operators by specific language rules.

Response

Although floating point types are derived from `root_real`, this does not imply any inheritance of subprograms. Inheritance happens for a derived type that is declared by a `derived_type_definition`, by 3.4(7). For private extensions, 7.3(16) and 12.5.1(20) apply. No such rules apply to other kinds of `type_definition`; therefore, no inheritance takes place for such types.

Section 4 explicitly defines the predefined operators that are implicitly declared for a type, according to its class. The mechanism of inheritance is not used for this purpose.

Note that this is not the only way in which the implicit derivation from a root numeric type is different from derivation via an explicit `derived_type_definition`. See, for example, 3.5.4(14) and AARM 3.5.4(14.a).

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PART 1 - TO BE COMPLETED BY WG SECRETARIAT
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PART 3 - EDITOR'S RESPONSE
ANY MATERIAL PROPOSED FOR PROCESSING AS A TECHNICAL CORRIGENDUM TO, AN AMENDMENT TO, OR A COMMENTARY ON THE INTERNATIONAL STANDARD OR DIS FINAL TEXT IS ATTACHED TO THIS COMPLETED REPORT: See next page.

8652/0100 Inconsistency with Ada 83 in the definition of exponentiation

Working Reference Number AI95-00018

Question

4.5.6(11) says:

The expression $X ** N$ with the value of the exponent N positive is equivalent to the expression $X * X * \dots * X$ (with $N-1$ multiplications) except that the multiplications are associated in an arbitrary order.

However, Ada 83 required left-to-right associations. Is this an upward inconsistency? (Yes.)

Summary of Response

The multiplications of an exponentiation are associated in an arbitrary order.

Response

Ada 83 required left-to-right associations, and AI83-00137 confirmed this. AI83-00868 allowed arbitrary association, but AI83-00868 was never formally approved. Hence, this represents an upward inconsistency, and should have been so documented in the AARM.

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PART 1 - TO BE COMPLETED BY WG SECRETARIAT
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8652/0101 **Conversions between access types with different representations**

Working Reference Number AI95-00097

Question

It is possible to declare types that are normally convertible, but that have a pragma Convention that makes some such conversions impossible or impractical. For instance,

```
type Ada_Ptr is access Integer; -- Integer is C-compatible in this
                                -- implementation.
type C_Ptr is new Ada_Ptr;
pragma Convention (C, C_Ptr);
```

The value sets of such convertible types may not completely overlap. For example, on a machine that is not 8-bit-byte addressable, an Ada_Ptr might be represented as a normal address, whereas a C_Ptr might be represented as a bit-field pointer of some sort.

What should happen when a value of C_Ptr has no corresponding value in Ada_Ptr?

Summary of Response

If the Convention (other than Ada) of an access type has been specified by the user, then the semantics of type conversions involving that access type are implementation defined.

Response

The semantics of such conversions are implementation defined. This follows from the fact that pragma Convention is a representation pragma (B.1(29)), and implementations can interpret representation pragmas however they want and place restrictions on them (13.1(20)), except when there are explicit rules to the contrary. This is also stated in the NOTE of B.1(43). So it's perfectly acceptable to raise an exception when a given operation doesn't make sense.

This is clearly desirable, since the goal of interfacing to another language is to match the representations chosen by the implementation of the other language, and doing so can make it impossible or impractical to obey the "normal" (non-interfaced) Ada semantics.

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PART 3 - EDITOR'S RESPONSE
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8652/0102 Visibility of inherited private components**Working Reference Number AI95-00157****Question**

Consider the following example:

```

package P is
  type Parent is tagged private;
private
  type Parent is
    record
      C: Integer;
    end record;
end P;

with P; use P;
package Q is
  type Child is new Parent with
    record
      C: Integer;
    end record;
end Q;

with Q; use Q;
package P.Child is
  type Grandchild is new Q.Child with null record;
  X: Grandchild;
  ... X.C ...
end P.Child;

```

What is the meaning of X.C, given that Grandchild is declared in a place where the full view of Parent is visible?

Summary of Response

Consider types Parent, Child, and Grandchild, derived from one another in that order. The components of Child are determined where Child is declared. If, at the place where Grandchild is declared, additional components of Parent are visible (that were not visible to Child), then Grandchild does *not* inherit them as visible components. One can convert from Grandchild to Parent in order to manipulate these components.

Response

There is a general design principle in Ada that you can never have more visibility into the components or operations of a type than in the package where the type is declared. Effectively, the components and operations of a type are "frozen" to be those visible somewhere within the "immediate" scope of the type. Even if you go into a package that knows more about the ancestors of the type, that doesn't change the set of components or primitives that the type has.

So in the above example, the type Child is declared in a place where there is no visibility on the C component of Parent; hence this component is not declared, and it is legal to declare another, unrelated, C component in Child. Thus, X.C refers to the C component declared in Child. This is despite the fact that at the point of "X.C", it *is* visible that Child is derived from Parent, and it *is* visible that Parent has a component called C. To refer to the C component from Parent, one would write Parent(X).C.

The C component from Parent does exist, despite the fact that it is not visible.

This paradox of knowing the ancestry of a type, but not being able to take advantage of it except through explicit conversion, also applied to derived types in Ada 83. It is based on the general notion that even inherited operations and components need to have a point of declaration, and that point of declaration is required to be in the immediate scope of the derived type. If there is no place where such implicit

declarations could occur, then the corresponding operations or components are not inherited. (Of course, inherited operations get declared (if at all) in the declarative region containing the type, whereas components get declared (if at all) in the declarative region of the type itself.)

See 7.3.1 and AARM-7.3.1(7.a-7.r).

Consider the following modified example:

```
package P is
  type Parent is tagged private;
private
  type Parent is
    record
      C: Integer;
    end record;
end P;

package P.Q is
  type Child is new Parent with
    record
      C: Integer; -- Illegal!
    end record;
end P.Q;
```

The above example is illegal, because in this case *Child* *does* inherit *C* from *Parent*, so the second declaration of *C* is an illegal homograph.

DEFECT REPORT

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PART 3 - EDITOR'S RESPONSE
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8652/0103 Type descriptors can be laid out at compile time

Working Reference Number AI95-00035

Question

The rules in 7.3.1 imply that for a type declared in a `package_declaration`, certain inherited subprograms can be declared in the `package_body`. How does this correspond to the intended implementation model of AARM 3.9(1.a-1.b)?

The intended implementation model is for a tag to be represented as a pointer to a statically allocated and link-time initialized type descriptor. The type descriptor contains the address of the code for each primitive operation of the type. It probably also contains other information, such as might make membership tests convenient and efficient.

The primitive operations of a tagged type are known at its first freezing point; the type descriptor is laid out at that point. It contains linker symbols for each primitive operation; the linker fills in the actual addresses.

Summary of Response

It is possible (and desirable) for an implementation to allocate and initialize type descriptors statically.

Response

Although the inherited subprogram might be declared in the `package_body`, the fact that it is going to be declared there is known at compile time of the `package_declaration`. Thus, there is no conflict with the above-mentioned implementation model.

DEFECT REPORT

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8652/0104 Finalization and Unchecked_Deallocation

Working Reference Number AI95-00179

Question

13.11.2(9) says that Free first performs finalization, then deallocates the storage. 7.6.1(17) says that (if Finalize propagates an exception,) Program_Error is raised after any other finalizations are performed.

In the case where Finalize propagates an exception, is the storage deallocated? Is it possible that Finalize will be called again on the same object?

Summary of Response

Consider an instance Free of Unchecked_Deallocation for a type with controlled parts. Free will first finalize its parameter. If some Finalize propagates an exception, then it is unspecified whether storage is deallocated, and whether the object ceases to exist. Finalize might be called again on that same object.

Response

The standard leaves this issue unspecified. There are three alternatives:

Alternative 1:

Storage is deallocated, and the object ceases to exist. Finalize will not be called again on that same object.

Alternative 2:

It is unspecified whether storage is deallocated. However, the object ceases to exist; Finalize will not be called again on that same object.

Alternative 3:

It is unspecified whether storage is deallocated, and whether the object ceases to exist. Finalize might be called again on that same object.

We choose Alternative 3, because this eases the burden on implementations, and because a Finalize that propagates an exception is a serious bug anyway. If there is a desire to recover from such situations, programmers should either prove that no such exception can happen, or put a "when others =>" clause in each Finalize procedure.

DEFECT REPORT

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8652/0105 Can an abstract subprogram be renamed?

Working Reference Number AI95-00211

Question

Can an abstract subprogram be renamed? (Yes.) Can a subprogram which must be overridden in the sense of 3.9.3(6) be renamed? (No.)

Consider an example with an abstract parent type and a primitive operation. 8.5.4(8) says that the renaming uses the original inherited subprogram, not the overriding version.

```
package Types is
  type T is abstract tagged ...
  procedure P (F : T) is abstract;
end Types;
package Extensions is
  type E is new Types.T with ...
  procedure Pr (F : E) renames P; -- renaming of inherited P
                                -- Legal? (No.)
  procedure P (F : E);
end Extensions;
```

A similar example can be constructed with a function with a controlling result.

```
package Types is
  type T is tagged ...
  function F return T;
end Types;
package Extensions is
  type E is new Types.T with ...
  function Fr return E renames F; -- renaming of inherited F
                                -- Legal? (No.)
  function F return E;
end Extensions;
```

Summary of Response

An abstract subprogram can be renamed, and the renamed view is also abstract. Such a renaming must appear in a place where the declaration of an abstract subprogram would be legal. Similarly, the "shall be overridden" property of 3.9.3(6) applies to a renamed view. Thus, any renaming of an inherited subprogram that must be overridden is illegal.

Response

The intent of the language is that an abstract subprogram can be renamed, and the renamed view is also abstract. All of the rules about declaring abstract subprograms apply at the point of the renaming (in particular, 3.9.3(3)).

Similarly, it is possible to write a renaming of an inherited subprogram which must be overridden because of the rules of 3.9.3(6). The intent of the language is that the "shall be overridden" property also applies to the renamed view. However, it is not possible to give an overriding for the renamed view (as the overriding specification would be an illegal homograph of the renamed subprogram). Thus, any renaming of an inherited subprogram that must be overridden is illegal.

DEFECT REPORT

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PART 3 - EDITOR'S RESPONSE
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8652/0106 Daylight savings and Ada.Calendar

Working Reference Number AI95-00160

Question

Suppose an implementation chooses to keep Calendar.Clock in some canonical form, such as GMT, and that it also chooses to support daylight savings time, by making Split and Time_Of do the appropriate conversions. Is this a valid implementation? (Yes.)

If so, what should Split do when daylight savings time ends in the fall, given that there are two different Time values for some Year/Month/Day/Second values? And what should Time_Of do when daylight savings time starts in the spring, given that there are Year/Month/Day/Second values that do not correspond to any Time?

Summary of Response

The values returned by Split and Time_Of are implementation defined at the boundaries of daylight savings time (assuming daylight savings time is supported by the implementation).

Response

9.6(24,26) say:

The functions Year, Month, Day, and Seconds return the corresponding values for a given value of the type Time, as appropriate to an implementation-defined timezone; the procedure Split returns all four corresponding values. Conversely, the function Time_Of combines a year number, a month number, a day number, and a duration, into a value of type Time. The operators "+" and "-" for addition and subtraction of times and durations, and the relational operators for times, have the conventional meaning.

The exception Time_Error is raised by the function Time_Of if the actual parameters do not form a proper date. This exception is also raised by the operators "+" and "-" if the result is not representable in the type Time or Duration, as appropriate. This exception is also raised by the function Year or the procedure Split if the year number of the given date is outside of the range of the subtype Year_Number.

9.6(24) uses the phrase "as appropriate to an implementation-defined timezone". The implementation is free to do daylight-savings-processing as part of its time zone handling, so the implementation suggested in the question above is valid. Since it explicitly says "implementation defined", the implementation can do what it wants, so long as the behavior is documented.

When implementing Ada on an operating system that supports time zones, it makes sense to implement the Ada operations in terms of the corresponding operating system operations. It is not reasonable to require Ada programs to do something different from other programs on that system. Nor is it reasonable to require an Ada implementation to re-implement this processing.

9.6(26) might be taken as a requirement that Time_Error be raised by Time_Of in the spring. However, the standard does not define what is meant by a "proper date". Clearly, February 31 is not a "proper date" -- the term is not entirely meaningless -- but surely the term is vague enough to allow the Ada implementation to use the underlying operating system's notion of "proper date" with respect to the questionable cases considered here. Furthermore, raising Time_Error is probably undesirable, since it is more likely to cause an Ada program to malfunction in rare cases, than to catch a bug in the program.

DEFECT REPORT

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8652/0107 Pragma Elaborate for child units

Working Reference Number AI95-00180

Question

10.2(9) says:

The order of elaboration of library units is determined primarily by the elaboration dependences. ... In addition, if a given library_item or ... has a pragma Elaborate ... that MENTIONS another library_unit, then there is an elaboration dependence of the given library_item upon the body of the other library_unit, ...

10.1.2(6) states:

A library_item is MENTIONED in a with_clause if it is denoted by a library_unit_name or a prefix in the with_clause.

Is the term "mentioned" as used in 10.2(9) meant to be defined by 10.1.2(6)? (No.) If so, it would imply that a pragma Elaborate on a child unit causes an elaboration dependence upon the parent of that child unit (as well as on the child unit itself). Is this the intent? (No.)

Summary of Response

A pragma Elaborate on a child unit does not imply an elaboration dependence upon the parent of that child unit.

Response

The intent is that 10.1.2(6) is defining "mentioned in a with_clause", not "mentioned" in general. The term "mentioned" in 10.2(9) is used in an informal sense; it merely means the library unit to which the pragma applies, and not its parent.

10.2.1(26) clarifies this:

A pragma Elaborate specifies that the body of the named library unit is elaborated before the current library_item.

If transitive semantics is desired, then pragma Elaborate_All should be used.

DEFECT REPORT

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8652/0108 Separate compilation of generic bodies

Working Reference Number AI95-00077

Question

10.1.4(3) states that the mechanisms for replacing compilation units within an environment are implementation defined. Is it intended that "mechanisms" also means "circumstances"? (No.)

This seems to be partly contradicted by NOTE 7 in 10.1.4(10) which prevents automatic removal of units that instantiate a generic body being replaced.

This NOTE however, does not seem to follow from any normative statement. 10.1.4(7) allows removal of compilation units that depend upon a given one, but nothing apparently prevents removal of compilation units that don't have such a dependency.

Summary of Response

The NOTE in 10.1.4(10), which says that separate compilation of generic bodies is required, is correct. This implies that an implementation must be capable of detecting legality errors in a compilation unit that instantiates a generic unit, without seeing the generic body. It does *not* imply that the compiler must generate code without seeing the generic body.

Response

10.1.4(3) is simply saying that the "commands" or "mouse clicks" that the user gives to perform various actions are implementation defined. It is not intended as a permission for the implementation to arbitrarily remove compilation units from the environment.

10.1.4(7) says when compilation units can be automatically removed, and this list is intended to be complete.

An implementation may, of course, have additional commands for removing compilation units, or performing any other actions on the environment.

DEFECT REPORT

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8652/0109 Matching rules for generic formal access-to-constant types

Working Reference Number AI95-00025

Question

12.5.4(4) states that "If and only if the `general_access_modifier` constant applies to the formal, the actual shall be an access-to-constant type". Is it really intended to forbid an access-to-variable type from being passed as an actual to a generic formal access-to-constant type? (Yes.)

Summary of Response

An access-to-variable type cannot be passed as an actual to a generic formal access-to-constant type.

Response

Consider the following example:

```

type Actual is access all Integer;
X: aliased constant Integer;

generic
  type Formal is access constant Integer;
package Gp is
  function F return Formal;
end Gp;

package body Gp is
  function F return Formal is
  begin
    return X'access;
  end F;
end Gp;

package Ip is new Gp (Formal => Actual); -- Illegal.

```

If the above were legal, then `Ip.F` would produce an access-to-variable value designating a constant, thus allowing a constant to be modified. This would be very bad. Hence, the "if and only if" wording of 12.5.4(4).

DEFECT REPORT

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PART 3 - EDITOR'S RESPONSE
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8652/0110 Order of Size and Small clauses for fixed point types

Working Reference Number AI95-00125

Question

Consider:

```
type Two_Bits_Spare is delta 4*System.Fine_Delta range -1.0..+1.0;
for Two_Bits_Spare'Size use Size_For_Fine_Delta - 2; -- Legal? (Maybe.)
```

where Size_For_Fine_Delta is the number of bits needed for a type whose delta is Fine_Delta. Does the Size clause force the implementation to choose the small of the type such that only Size_For_Fine_Delta - 2 bits are needed? (No.)

13.3(55) says that 'Size should/must be "the number of bits needed to represent each value belonging to the subtype ..." and that an implementation should/must support a specified 'Size for a first subtype that reflects this representation.

3.5.9(8) says "the set of values of a fixed-point type comprise[s] the integral multiples of a number called the small of the type" which if not specified "is an implementation-defined power of two ..."

Summary of Response

A Size clause does not determine the values of an ordinary fixed point type. The values are determined either by the implementation, or by a Small clause; the legality of a Size clause is determined in part by the values chosen.

Response

A Size clause does not determine the values of an ordinary fixed point type. The values are determined either by the implementation, or by a Small clause; the legality of a Size clause is determined in part by the values chosen.

Since there is no Small clause in the above example, 3.5.9(8) allows the implementation to choose among various powers of two as the small, and the small determines what the values of the type are. A Size clause is required to specify enough bits to represent all those values. Thus, the Size clause in the above example is legal if the implementation chooses small to be $4 * \text{System.Fine_Delta}$, but is illegal if the implementation chooses small to be System.Fine_Delta .

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8652/0111 Storage pools and access types designating task types

Working Reference Number AI95-00103

Question

If a user-defined storage pool is specified for an access-to-task type, does this imply that the user's storage pool will be used for all data structures associated with the task, such as the TCB and the task stack? (No.)

Summary of Response

The specification of a user-defined storage pool for an access-to-task type permits the user-defined allocation and deallocation of task objects, not necessarily of the implementation-defined tasking structures that support the task object.

Response

Many implementations choose to implement a task object as an access to the implementation-defined data structures associated with the task (such as a Task Control Block (TCB) and a task stack). In such an implementation, a user-defined storage pool will control only the allocation of the task objects (i.e. the access object), and will have no effect on the allocation and deallocation of those other resources.

Note that in some such systems, it may be impossible to allow user-defined allocation of TCBs via the storage pool mechanism, because the TCBs are in a separate address space, or are allocated in a run-time system table.

DEFECT REPORT

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8652/0112 A box for a formal subprogram_default freezes the actual

Working Reference Number AI95-00040

Question

Consider:

```

type T is ....
type T2 is ...
function "+"(A: T; B: T2) return T;

generic
  type FT is private;
  with function "+"(A: FT; B: T2) return FT is <>;
package GP is ...

package IP is new GP(T);
  -- does this instantiation freeze "+" and therefore T2? (Yes.)

```

13.14(5) doesn't cover that case.

Summary of Response

A box for a formal subprogram_default freezes the actual subprogram determined in an instantiation.

Response

A box for a formal subprogram_default freezes the actual subprogram determined in an instantiation.

12.6(10) says, "If a generic unit has a subprogram_default specified by a box, and the corresponding actual parameter is omitted, then it is equivalent to an explicit actual parameter that is a usage name identical to the defining name of the formal."

Thus, the instantiation GP(T) is equivalent to the instantiation GP(T, "+").

13.14(4,5,14) then demand that "+" and T2 are frozen by the instantiation.

DEFECT REPORT

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PART 1 - TO BE COMPLETED BY WG SECRETARIAT
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8652/0113 Saving and restoring Current_Output

Working Reference Number AI95-00087

Question

It's clear from the example in section A.4.3 of the Rationale that one should be able to use the subprograms `Current_Output` and `Set_Output` to save and restore `Text_IO`'s current output file, using an object of type `File_Access`. However, given what I believe to be a typical implementation of `Text_IO`, this won't work.

Assume that `Text_IO` declares a hidden aliased object of type `File_Type`, called, say, `Current_Output_Object`. (How the type `File_Type` is declared is irrelevant here; it may be a pointer, a descriptor record, a descriptor number, or whatever, as long as the view from the body of `Text_IO` is not limited.) The bodies of the `Current_Output` and `Set_Output` functions can then simply be:

```

procedure Set_Output (File : in File_Type) is
begin
    Current_Output_Object := File;
end Set_Output;

function Current_Output return File_Type is
begin
    return Current_Output_Object;
end Current_Output;

function Current_Output return File_Access is
begin
    return Current_Output_Object'access;
end Current_Output;

```

Recall that the example in Rationale-A.4.3 looks like this:

```

procedure P(...) is
    New_File      : File_Type;
    Old_File_Ref : constant File_Access := Current_Output;
begin
    Open(New_File, ...);
    Set_Output(New_File);
    -- use the new file
    Set_Output(Old_File_Ref.all);
    Close(New_File);
end P;

```

If we are using the `Text_IO` implementation above, `Old_File_Ref` will be initialized to point to `Current_Output_Object`, the first call to `Set_Output` will change the value of `Current_Output_Object`, the second call to `Set_Output` will have no effect, and the `Close` will close a file that's still being used as the current output file. Thus any operations on `Current_Output` after the call to `P` will be erroneous by A.10.3(23).

Is the suggested implementation of `Text_IO` legal? (No.) If so, the example in the Rationale is non-portable. If not, how can the prohibition be inferred from the International Standard?

Summary of Response

`Current_Output` and `Set_Output` can be used to save and restore `Text_IO`'s current output file, using an object of type `File_Access`.

Response

The suggested implementation is wrong.

A.7(2) states, "In the remainder of this section, the term file is always used to refer to a file object...."

A.10(5) states, "At the beginning of program execution the default input and output files are the so-called standard input file and standard output file." By A.7(2), this can be paraphrased as follows: "At the beginning of program execution the default input and output file objects are the so-called standard input file object and standard output file object." That is, the terms "default input file object" and "default output file object" are not names of distinct file objects, but of a *role* played by a file object. That is, the only way that a single file object can be both the standard input file and the default input file is if the default input file is not a file object distinct from all other file objects. (The role played by the file objects currently acting as the default objects is described by A.10(4): "If no file is specified, a default input file or a default output file is used." This is the closest the International Standard comes to defining what a default file is, and the terms should probably have been italicized.)

It follows that `Current_Output` and `Set_Output` can be used to save and restore `Text_IO`'s current output file, using an object of type `File_Access`.

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8652/0114 Mapping between Interfaces.C.char and Standard.Character

Working Reference Number AI95-00038

Question

B.3(46) states that To_Ada and To_C map between Character and char, but does not explain how. Presumably, Interfaces.C.char corresponds to the C type char, i.e., to the native character set of the target machine. Type Character, of course, always corresponds to Latin-1, regardless of the target machine. On an EBCDIC machine, does To_C('A') yield the C.Interfaces.char value corresponding to EBCDIC 'A', or does it yield the character whose EBCDIC code is Character'Pos('A')?

Summary of Response

The To_C and To_Ada functions in Interfaces.C map between corresponding characters, not necessarily between characters with the same internal representation. Corresponding characters are characters defined by the same enumeration literal, if such exist; otherwise, the correspondence is not defined by the language.

Response

The intent is that 'A' maps to 'A', even if the two 'A's have different representations.

The following definition is equivalent to the above summary:

To_C (Latin_1_Char) = char'Value(Character'Image(Latin_1_Char)) provided that char'Value does not raise an exception; otherwise the result is not defined by the language.

To_Ada (Native_C_Char) = Character'Value(char'Image(Native_C_Char)) provided that Character'Value does not raise an exception; otherwise the result is not defined by the language.

DEFECT REPORT

The submitter of a defect report shall complete the items in Part 2 and shall send the form to the Convener or the Secretariat of the WG with which the relevant editor's group is associated.

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PART 3 - EDITOR'S RESPONSE
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8652/0115 Ada.Task_Identification.Is_Callable for the environment task

Working Reference Number AI95-00206

Question

What is the behavior of `Ada.Task_Identification.Is_Callable` for the environment task? In particular, does it change in value from `True` to `False` when the main subprogram exits and starts waiting for library-level tasks to terminate? (Yes.)

Summary of Response

`Ada.Task_Identification.Is_Callable` called with a `Task_Id` value designating the environment task returns `True` while the main subprogram is executing and `False` once the main subprogram has returned and the environment task starts waiting for library-level tasks to terminate.

Response

The NOTE C.7.1(21) says that `Ada.Task_Identification.Current_Task` can return a `Task_Id` value designating the environment task. 9.8(2) specifies that `Is_Callable` returns `True` unless the task is completed or abnormal. The structure of the environment task given in 10.2(10-12), and the dynamic semantics of 10.2(25) tell us that the environment task is completed before waiting for dependent tasks. The erroneous execution case of C.7.1(18) should not apply, as the environment task continues to exist until the partition terminates.

Therefore, the value of `Ada.Task_Identification.Is_Callable` is well defined. It is possible to test the value after the completion of the environment task in a library-level task (while the environment task is waiting for dependent tasks to terminate). Thus it cannot be implemented purely as a return of `True` at all times.

The `Ada.Task_Identification.Is_Callable` flag can be useful, as a library-level task can use the value to terminate itself once the partition has completed. This is especially important to bullet-proof a reusable package containing a library task. At least one commercial Ada library uses this technique.

DEFECT REPORT

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8652/0116 One queuing policy per partition

Working Reference Number AI95-00069

Question

Implementation Permissions D.4(15) says:

Implementations are allowed to define other queuing policies, but need not support more than one such policy per partition.

Does the permission to support only one policy per partition apply only to the "other" (implementation defined) policies? (No.)

Summary of Response

An implementation need not support more than one queuing policy per partition. For example, the implementation need not support both FIFO_Queueing and Priority_Queueing in the same partition.

Response

The second part of the Implementation Permission applies to all queuing policies.

10.1.5(9) says:

An implementation may place restrictions on configuration pragmas, so long as it allows them when the environment contains no library_items other than those of the predefined environment.

This implies that an implementation need not support more than one queuing policy per partition, whether or not the policy is implementation defined. Of course, the "other" policies mentioned in D.4(15) are implementation defined, so the implementation can restrict them in any way it sees fit. Required support for more than one policy in the same partition would be an implementation burden that is not worthwhile.