Subject: Interpretation request: Representation method of result of REAL
From: Van Snyder

Number

TBD

Title

Representation method of result of REAL.

Keywords

"Representation method" KIND REAL.

Defect type

Interpretation.

Status

J3 consideration in progress.

Questions

Subclause numbers refer to 97-007r2.

The second and third sentences of subclause 4.3.1.2 are

> A processor shall provide two or more **approximation methods** that define sets of values for data of type real. Each such method has a **representation method** and is characterized by a value for a type parameter called the `kind` type parameter.

1. Does this imply that there is a one-to-one correspondence between kind type parameter values and representation methods?

Since the second quoted sentence says "a value," not "some values," assume the answer to this question is "yes."

Subclause 7.1.4.2 specifies the type and kind type paramter value for the result of an operation.

2. Is a processor allowed to use a representation method that corresponds to a different kind type parameter value of the same type, or no kind type parameter value, at least if neither the precision nor exponent range of the different representation method is less than the one specified in 7.1.4.2?

Subclause 7.1.4.1 specifies the type and kind type paramter value for a variable.

3. Is a processor allowed to use a representation method that corresponds to a different kind type parameter value of the same type, or no kind type parameter value, at least if neither the precision nor exponent range of the different representation method is less than the one specified in 7.1.4.1?

Subclause 7.1.4.1 specifies the type and kind type paramter value for a result of a function.

4. Is a processor allowed to use a representation method that corresponds to a different kind type parameter value of the same type, or no kind type parameter value, at least if neither the precision nor exponent range of the different representation method is less than the one specified in 7.1.4.1?

Subclause 13.14.28 specifies that the result of DBLE is the same as the result of REAL with a KIND argument having the value KIND(0.0d0).

Subclause 13.14.88 specifies that the kind type parameter value of the result of REAL is that specified by the KIND argument.

5. Is a processor allowed to use a representation method for the result that corresponds to a different kind type parameter value of the same type, or no kind type parameter value, at least if neither the precision nor exponent range of the different representation method is less than the one specified in 13.14.88?

Answers

1. Yes, but there should be exceptions, to allow the recommended answers for the questions below.

2. No, but it probably ought to be yes. Otherwise, a processor cannot retain intermediate results of expression evaluation in registers that have additional range or precision.

3. No, but it probably ought to be yes. Otherwise, inter-statement optimizations that result in leaving expression results in registers that have additional range or precision from one statement to another, that is, those in which stores are eliminated, would be prohibited.

4. No, but it probably ought to be yes, at least in limited circumstances. Otherwise, if the answer to Question 2 is as specified above, a function reference that is replaced by the text of the function's body would have different performance and different results from one automatically inlined by the processor.

5. No.

Ideally, the answers to Questions 2 through 5 should be "it depends," and a construct should be provided to specify where "it depends" applies. But that would be a feature request, not an interpretation request.

Edits

In the third sentence in subclause 4.3.1.2, replace "and" by ". Each representation method" and replace "a value" by "at most one value". At the end of that sentence insert "; a processor may provide representation methods that are not characterized by any kind type parameter value". After that sentence, insert a new sentence: "With exceptions specified in 7.1.4.1 and 7.1.4.2, each kind type parameter value specifies one representation method, which shall be used to represent constants of the specified kind."

In the first sentence of the second paragraph of 4.3.1.3, replace "approximation" by "representation". Replace the second sentence by "A **kind** type parameter may be specified for a complex entity; it specifies the kind type parameter value for both the real and imaginary parts." Then insert a new sentence: "With the exceptions specified in 7.1.4.1, the representation method (4.3.1.2) of the real and imaginary parts of the entity shall be the same as a constant of type real having the same kind type parameter value." In the third sentence, insert "value" after "parameter".

At the end of each of subclauses 5.1.1.1, 5.1.1.2 and 5.1.2.3, insert the same new sentence: "With the exceptions specified in 7.1.4.1, the representation method (4.3.1.2) of the entity shall be the same as a constant having the same kind type parameter value."

At the end of the first paragraph of subclause 7.1.4.1, add two new sentences: "If the variable is of type real, the representation method (4.3.1.2) shall be the same as a constant having the same kind type parameter value, or may be one that has greater exponent range, greater precision, or both; this representation method may correspond to a different kind type parameter, or to no kind type parameter. If the primary is a reference to a functon other than REAL and the result is of type real, the representation method shall be the same as a constant having the same kind type parameter value, or may be one that has greater exponent range, greater precision, or both; this representation method may correspond to a different kind type parameter value, or to no kind type parameter value."

Ideally, the third paragraph of subclause 7.1.4.2 should be rewritten — it has been in the FCD — or taken out and shot. Failing that, before the sentence that begins "In the case that both operands are of type integer..." insert a new sentence: "If the type of the expression is real, the representation method (4.3.1.2) shall be the same as a constant having the same kind type parameter value, or may be one that has greater exponent range, greater precision, or both; this representation method may correspond to a different kind type parameter value, or to no kind type parameter value."

After the **Result characteristics** section of subclause 13.14.20, insert a note:

NOTE 13.7$\frac{1}{2}$

The repesentation method (4.3.1.2) of the real and imaginary parts of the result shall be the same as a constant of type real having the same kind type parameter value as the result.

1 After *Case (ii)* in the **Result characteristics** section of subclause 13.14.88, insert a note:

NOTE 13.13$\frac{1}{2}$

The repesentation method (4.3.1.2) of the result shall be the same as a constant of type real having the same kind type parameter value as the result.

2 Submitted by

3 Van Snyder

4 History

5 168-wvs-009 m168