**Details of Language Change**

Changes shown in red font. Deletions shown in ~~strikethrough red font~~. Comments shown in green font.

Twiki has not been kind in regards to font colors and strikethrough. Word and PDF versions of these changes are attached as separate files to this LCS.

**LRM 4.2.1 General (Subprogram declarations)**

**Page 21 Immediately before section 4.2.2.2**

NOTE-- ~~Attributes of an actual are never passed into a subprogram.~~ References to an attribute of a formal parameter are legal only if that formal has such an attribute. Such references retrieve the value of the attribute associated with the actual.

**LRM 4.2.2.2 Constant and variable parameters**

**Page 21, near middle**

Editor note: There are two references to “Determinable index range conditions’ listed in section 9.3.3.3--Array aggregates” in this modification. This reference is to a change defined in LCS-2016-072 which therefore makes this LCS dependent on LCS-2016-072. If this LCS is approved and LCS\_2016-072 is not, the changes referencing ‘Determinable index range conditions’ must be migrated to this LCS. That change is defined in LCS-2016-072 under changes for section 4.2.1 ‘Page 20 Add after the first paragraph’.

For parameters of class constant or variable, ~~only~~ the values and attributes of the actual or formal are transferred into or out of the subprogram call. The manner of such transfers, and the accompanying access privileges that are granted for constant and variable parameters, are described in this subclause.

For a nonforeign subprogram having a parameter of class constant or variable, if the actual meets any of the conditions of ‘Determinable index range conditions’ listed in section 9.3.3.3--Array aggregates, the attributes of the parameter shall be assigned from the corresponding attributes of the actual. If the actual does not meet any of the conditions of ‘Determinable index range conditions’ listed in section 9.3.3.3--Array aggregates, the attributes of the parameter shall be assigned as:

* BASE, SUBTYPE: Same as BASE, SUBTYPE attributes as defined in section 16.2.2 Predefined attributes of types and objects
* LEFT, RIGHT, HIGH, LOW: Set to the value of the actual.
* ASCENDING: Set to TRUE

**LRM 4.2.2.3 Signal parameters**

**Page 22 near middle**

For a signal parameter of mode in or inout, the actual signal is associated with the corresponding formal signal parameter at the start of each call. Thereafter, during the execution of the subprogram body, a reference to the formal signal parameter within an expression is equivalent to a reference to the actual signal. A reference to an attribute of the formal signal parameter is equivalent to a reference to the attribute of the actual signal.

**LRM 16.2.3 Predefined attributes of arrays**

**Page 243 top of the page**

Renumber this section as 16.2.3.1 and rename 16.2.3 as "Predefined attributes of arrays and scalars"

**Page 244 near the top of the page**

Add new section 16.2.3.2 Predefined attributes of scalars with text as shown below. Note: This content of this new section is based solely on the text from 16.2.3.1, but removing all references to arrays. As such, the red font and strikethrough of text is meant only to convey the differences between 16.2.3.1 and 16.2.3.2 to aid in the review process. Strikethrough text is not to be part of the LRM revision.

**16.2.3.2 Predefined attributes of scalars**

Throughout this section one will see SA in red font with a strikethrough on the A only which may be difficult to discern.

S~~A~~'LEFT ~~[(N)]~~ Kind: Value.

Prefix: Any prefix S~~A~~ that is appropriate for a ~~an~~ ~~array~~ scalar object, or an alias thereof, or that denotes a ~~an~~ ~~array~~scalar subtype whose ~~index~~ range is ~~ranges are~~ defined by a constraint.

~~Parameter: A locally static expression of type universal\_integer, the value of which shall not exceed the dimensionality of A. If omitted, it defaults to 1.~~

Result type: Type of the left bound of the ~~Nth index~~ range of S~~A~~.

Result: Left bound of the ~~Nth index~~range of S~~A~~. (If S~~A~~ is an alias for a ~~an~~ ~~array~~ scalar object, then the result is the left bound of the ~~Nth index~~range from the declaration of S~~A~~, not that of the object.)

S~~A~~'RIGHT ~~[(N)]~~ Kind: Value.

Prefix: Any prefix S~~A~~ that is appropriate for a ~~an~~ ~~array~~ scalar object, or an alias thereof, or that denotes a ~~an~~ ~~array~~ scalar subtype whose ~~index~~ range is ~~ranges are~~ defined by a constraint.

~~Parameter: A locally static expression of type universal\_integer, the value of which shall not exceed the dimensionality of A. If omitted, it defaults to 1.~~

Result type: Type of the ~~Nth index~~range of S~~A~~.

Result: Right bound of the ~~Nth index~~range of S~~A~~. (If S~~A~~ is an alias for a ~~an~~ ~~array~~ scalar object, then the result is the right bound of the ~~Nth index~~range from the declaration of S~~A~~, not that of the object.)

S~~A~~'HIGH ~~[(N)]~~ Kind: Value.

Prefix: Any prefix S~~A~~ that is appropriate for a ~~an~~ ~~array~~ scalar object, or an alias thereof, or that denotes a ~~an~~ ~~array~~ scalar subtype whose ~~index~~ range is ~~ranges are~~ defined by a constraint.

~~Parameter: A locally static expression of type universal\_integer, the value of which shall not exceed the dimensionality of A. If omitted, it defaults to 1.~~

Result type: Type of the ~~Nth index~~range of S~~A~~.

Result: Upper bound of the ~~Nth index~~range of S~~A~~. (If S~~A~~ is an alias for a~~n~~ ~~array~~ scalar object, then the result is the upper bound of the ~~Nth index~~range from the declaration of S~~A~~, not that of the object.)

S~~A~~’LOW ~~[(N)]~~ Kind: Value.

Prefix: Any prefix S~~A~~ that is appropriate for a~~n~~ ~~array~~ scalar object, or an alias thereof, or that denotes a~~n~~ ~~array~~ scalar subtype whose ~~index~~ range is ~~ranges are~~ defined by a constraint.

~~Parameter: A locally static expression of type universal\_integer, the value of which shall not exceed the dimensionality of A. If omitted, it defaults to 1.~~

Result type: Type of the ~~Nth index~~range of S~~A~~.

Result: Lower bound of the ~~Nth index~~range of S~~A~~. (If S~~A~~ is an alias for a~~n~~ ~~array~~ scalar object, then the result is the lower bound of the ~~Nth index~~range from the declaration of S~~A~~, not that of the object.)

S~~A~~’RANGE ~~[(N)]~~ Kind: Range.

Prefix: Any prefix S~~A~~ that is appropriate for a~~n~~ ~~array~~ scalar object, or an alias thereof, or that denotes a~~n~~ ~~array~~ scalar subtype whose ~~index~~ range is ~~ranges are~~ defined by a constraint.

~~Parameter: A locally static expression of type universal\_integer, the value of which shall not exceed the dimensionality of A. If omitted, it defaults to 1.~~

Result type: The type of the ~~Nth index~~range of S~~A~~.

Result: The range S~~A~~’LEFT~~(N)~~ **to**S~~A~~’RIGHT~~(N)~~ if the ~~Nth index~~range of S~~A~~ is

ascending, or the range S~~A~~’LEFT~~(N)~~ **downto**S~~A~~’RIGHT~~(N)~~ if the ~~Nth~~range of S~~A~~ is descending. (If S~~A~~ is an alias for scalar object, then the result is determined by the ~~Nth index~~range from the declaration of S~~A~~, not that of the object.)

S~~A~~’REVERSE\_RANGE ~~[(N)]~~ Kind: Range.

Prefix: Any prefix S~~A~~ that is appropriate for a ~~an~~ ~~array~~ scalar object, or an alias thereof, or that denotes a ~~an~~ ~~array~~ scalar subtype whose ~~index~~ range is ~~ranges are~~ defined by a constraint.

~~Parameter: A locally static expression of type universal\_integer, the value of which shall not exceed the dimensionality of A. If omitted, it defaults to 1.~~

Result type: The type of the ~~Nth index~~range of S~~A~~.

Result: The range S~~A’~~RIGHT~~(N)~~ **downto**S~~A'~~LEFT~~(N)~~ if the ~~Nth index~~range of S~~A~~ is ascending, or the range S~~A~~’RIGHT~~(N)~~ **to**S~~A~~’LEFT~~(N)~~ if the ~~Nth~~ range of S~~A~~ is descending. (If S~~A~~ is an alias for a~~n~~ ~~array~~ scalar object, then the result is determined by the ~~Nth index~~range from the declaration of S~~A~~, not that of the object.)

S~~A~~’LENGTH ~~[(N)]~~ Kind: Value.

Prefix: Any prefix S~~A~~ that is appropriate for a ~~an~~ ~~array~~ scalar object, or an alias thereof, or that denotes a~~n~~ ~~array~~ scalar subtype whose ~~index~~ range is ~~ranges are~~ defined by a constraint. S~~A~~ cannot be of type real or a physical type.

~~Parameter: A locally static expression of type universal\_integer, the value of which shall not exceed the dimensionality of A. If omitted, it defaults to 1.~~

Result type: *universal\_integer* .

Result: Number of values in the ~~Nth index~~range; i.e., if the ~~Nth index~~range of S~~A~~ is a null range, then the result is 0. Otherwise, the result is the value of T'POS(S~~A~~’HIGH~~(N)~~) T'POS(S~~A~~’LOW~~(N)~~) + 1, where T is the subtype of ~~the Nth index of~~ S~~A~~.

S~~A~~’ASCENDING ~~[(N)]~~ Kind: Value.

Prefix: Any prefix S~~A~~ that is appropriate for a~~n~~ ~~array~~ scalar object, or an alias thereof, or that denotes a~~n~~ ~~array~~ scalar subtype whose ~~index~~ range is ~~ranges are~~ defined by a constraint.

~~Parameter: A locally static expression of type universal\_integer, the value of which shall not exceed the dimensionality of A. If omitted, it defaults to 1.~~

Result type: Type BOOLEAN.

Result: TRUE if the ~~Nth index~~range of S~~A~~ is defined with an ascending range; FALSE otherwise.

S~~A~~’ELEMENT Kind: Subtype.

Prefix: Any prefix S~~A~~ that is appropriate for a~~n~~ ~~array~~ scalar object, or an alias thereof, or that denotes a~~n~~ ~~array~~ scalar subtype.

Result: If S~~A~~ is a~~n~~ ~~array~~ scalar subtype, the result is the element subtype of S~~A~~. If S~~A~~ is a ~~an~~ ~~array~~ scalar object, the result is the fully constrained element subtype that is the element subtype of S~~A., together with constraints defining any index ranges that are determined by application of the rules of 5.3.2.2.~~

(If S~~A~~ is an alias for a ~~an array~~ scalar object, then the result is determined by the declaration of S~~A~~, not that of the object.)