**BUFFER ISSUE RESOLUTION DOCUMENT (BIRD)**

**BIRD NUMBER:** (Draft 4)

**ISSUE TITLE:** Format and Usage Out Clarifications

**REQUESTOR:**  Michael Mirmak, Intel Corporation

**DATE SUBMITTED:** Draft 4 – Dec. 6, 2016

**DATE REVISED:**

**DATE ACCEPTED:**

**DEFINITION OF THE ISSUE:**

The text of the Format portion of IBIS 6.1, Section 10.3 is written primarily from the perspective of Usage In or InOut. This should be modified to ensure that the meaning of Usage Out arguments, if permitted, is clear.

**SOLUTION REQUIREMENTS:**

The IBIS specification must meet these requirements:

Table 1: Solution Requirements

|  |  |
| --- | --- |
| Requirement | Notes |
| 1. The definition of parameters such as “Format” must be presented explicitly. |  |
| 1. The data path used for information associated with different Usage assignments must be presented clearly for each parameter, including “Format”. This must include “In”, “InOut”, and “Out” at a minimum, and preferably include “Dep”. |  |

**SUMMARY OF PROPOSED CHANGES:**

For review purposes, the proposed changes are summarized as follows:

Table 2: IBIS Keywords, Subparameters, AMI Reserved\_Parameters, and AMI functions Affected

|  |  |  |
| --- | --- | --- |
| Specification Item | New/Modified/Other | Notes |
| The definition of “Format” is added, along statements on the relationship between Usage “In”, “Out”, “InOut” and “Dep” for “Format”. Finally the correct data flow between various Usage settings, the EDA tool and the algorithmic model is clarified. | Other | The technical definitions and parser operation are unaffected by the proposed text changes. |

**PROPOSED CHANGES:**

*The introductory portion of “Format’, starting on page 186 of IBIS 6.1 Section 10.3 is proposed to be modified**from the following:*

**Format <data\_format>** <data>or **<data\_format>**<data>:

Required, except for the <data\_format> selection of Value as noted below. The word “Format” as part of the Format <data\_format> <data> sequence is optional. Valid entries for the <data\_format> and <data> fields are:

**Value** <value>

Single value data. The model maker may provide any value without any restrictions within the constraints of the Type of the variable. Note that Value and Default (defined below) are mutually exclusive, and shall not be used together for the same parameter.

**Range** <typ value> <min value> <max value>

This defines a continuous range for which the user may select any value greater than or equal to <min value> and less than or equal to <max value> within the constraints of the Type of the variable

**List** <default value> <value> <value> <value> ... <value>

This defines a discrete set of values from which the user may select one value

**List\_Tip** <default\_entry><entry><entry><entry>…<entry>

This is an optional leaf of a parameter with Format **List** and it is followed by a String entry for each entry in the **List**. The number of entries in List\_Tip must be the same as the number of entries in **List**. The nth entry in List\_Tip shall correspond to the nth entry in **List**. Quoted null entries are not permitted. All entries in List\_Tip shall be unique, except that if two entries in **List** are the same, then the corresponding List\_Tip entries must also be the same. List is required for List\_Tip to be entered, and the word Format before List\_Tip as in (Format List\_Tip ,,,) is not allowed.

Example:

(Strength (Usage In) (Type Integer) (Description "Strength of Driver")

(List 0 1 2 3 4) (Default 2)

(List\_Tip "Extra Weak" "Weak" "Nominal" "Strong" "Extra Strong"))

**Corner** <typ value> <slow value> <fast value>

Corner is not allowed with Usage Out parameters. The selection of one value is automatically carried out by the EDA tool based on its internal simulation corner setting

**Increment** <typ> <min> <max> <delta>

where min <= typ <= max and delta is always positive. After expansion, the expanded values of the parameter are typ + N\*delta where N is any positive or negative integer value provided by the EDA tool during the expansion process so that: min <= expanded values <= max

**Steps** <typ> <min> <max> <# steps>

Treat exactly like Increment with <delta> == (<max>-<min>)/<# steps>

**Table** and optional leaf **Labels**

The Format Table states that this parameter consists of one or more columns of data, with each row delimited by parentheses “(“ and “)”. All rows must contain the same number of entries (columns). At least one row shall be included. Default is illegal when Format Table is used.

*…to:*

**Format <data\_format>** <data>or **<data\_format>**<data>:

Format defines the context or arrangement of the data being presented to the the EDA tool. For Usage In and Usage InOut, the EDA tool may accept data provided by the user according to the Format selected. Format is required, except for the <data\_format> selection of Value as noted below. The word “Format” as part of the Format <data\_format> <data> sequence is optional. Unless otherwise noted, Usage Out arguments or data of Type Value or Default provided as Format are effectively ignored by EDA tools. However, Format may determine how data is presented to the user by the EDA tool, particularly when data is returned by the executable model file (for example, data of Type Table). Data of Usage Dep, Usage Info or Usage Out shall not be passed to the executable model file by the EDA tool, unlike data of Usage In or InOut, which shall always be passed to the executable model file by the EDA tool.

Valid entries for the <data\_format> and <data> fields are:

**Value** <value>

Value consists of a single value of data. For Usage In and InOut, the model maker may provide any value without any restrictions within the constraints of the Type of the variable. Note that Value and Default (defined below) are mutually exclusive, and shall not be used together for the same parameter.

**Range** <typ value> <min value> <max value>

This defines a continuous range for which the user may select, for Usage In and InOut, any value greater than or equal to <min value> and less than or equal to <max value> within the constraints of the Type of the variable.

**List** <default value> <value> <value> <value> ... <value>

This defines a discrete set of values from which the user may select, for Usage In and InOut, one value.

**List\_Tip** <default\_entry><entry><entry><entry>…<entry>

This is an optional leaf of a parameter with Format **List** and it is followed by a String entry for each entry in the **List**. The number of entries in List\_Tip shall be the same as the number of entries in **List**. The nth entry in List\_Tip shall correspond to the nth entry in **List**. Quoted null entries are not permitted. All entries in List\_Tip shall be unique, except that if two entries in **List** are the same, then the corresponding List\_Tip entries shall also be the same. List is required for List\_Tip to be entered, and the word Format before List\_Tip as in (Format List\_Tip ,,,) is not allowed.

Example:

(Strength (Usage In) (Type Integer) (Description "Strength of Driver")

(List 0 1 2 3 4) (Default 2)

(List\_Tip "Extra Weak" "Weak" "Nominal" "Strong" "Extra Strong"))

**Corner** <typ value> <slow value> <fast value>

Corner is not allowed with Usage Out parameters. For Usage In and InOut, the selection of one value is automatically carried out by the EDA tool based on its internal simulation corner setting.

**Increment** <typ> <min> <max> <delta>

The Increment Format defines a range of discrete integer values which can be swept by the EDA tool using a specified value (“delta”), where min <= typ <= max and delta is always positive. After expansion, the expanded values of the parameter are typ + N\*delta where N is any positive or negative integer value provided by the EDA tool during the expansion process so that: min <= expanded values <= max.

**Steps** <typ> <min> <max> <# steps>

The Steps Format operates exactly like Increment with <delta> == (<max>-<min>)/<# steps>

**Table** and optional leaf **Labels**

The Format Table consists of one or more columns of data, with each row delimited by parentheses “(“ and “)”. All rows shall contain the same number of entries (columns). At least one row shall be included. Default is illegal when Format Table is used.

**BACKGROUND INFORMATION/HISTORY:**

The need for this BIRD was explained in BUG 183 (<http://www.ibis.org/bugs/ibischk/bug183.txt>). The document was reviewed and contains edits from the participants in IBIS-ATM meetings held in November and December, 2016.