Notes on Usage Out parameters in IBIS-AMI

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Problem statement

From IBIS v5.0, pg. 140:

```
| Usage:    (required for model specific parameters)
|   In      Parameter is required Input to executable
|   Out     Parameter is Output only from executable
|   Info    Information for user or EDA platform
|   InOut   Required Input to executable. Executable may return different value.
```

From BIRD 127.4:

```
|*              All parameters must be in the following format:
|*
|*              (parameter_name (Usage <usage>)
|*                              (Type <data_type>)
|*                              ({Format} <data_format> <data>)
|*                              (Default <value>)
|*                              (Description <string>))
```

Value
Range
List
Corner
Increment
Steps
Table

What is the purpose of <data> in the .ami file for Usage Out parameters if they are "Output only from executable"?
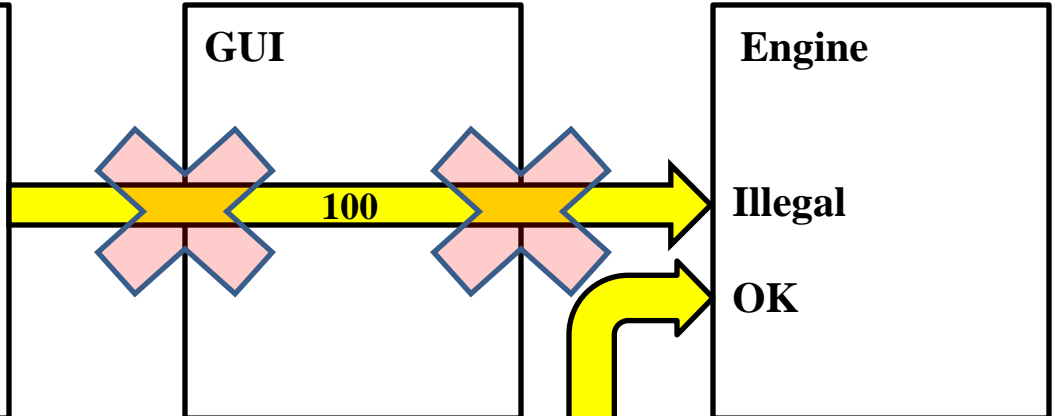
- is <data> in the .ami file supposed to be ignored?
- is <data> supposed to be used to initialize something?
  - if so, what? A variable in the EDA tool, or the AMI model?
- what is the meaning of Default?
  - is it a *__default value__* for a variable in the EDA tool, or in the AMI model?
  - is it a *__default pick__* for a Format Range, List, Increment, Steps parameter?
- does anything else other than Value, Default and Table make sense for Usage Out?
  - or, is the EDA tool supposed to check the value returned by the model against the .ami file?

Example 1

.ami file

```
(MyExample
    (Description "Example")
    (Reserved_Parameters
        (MyRterm
            (Usage Out)
            (Type Integer)
            (Value 100)
            (Description "Illustration")
        )
    )
)
```
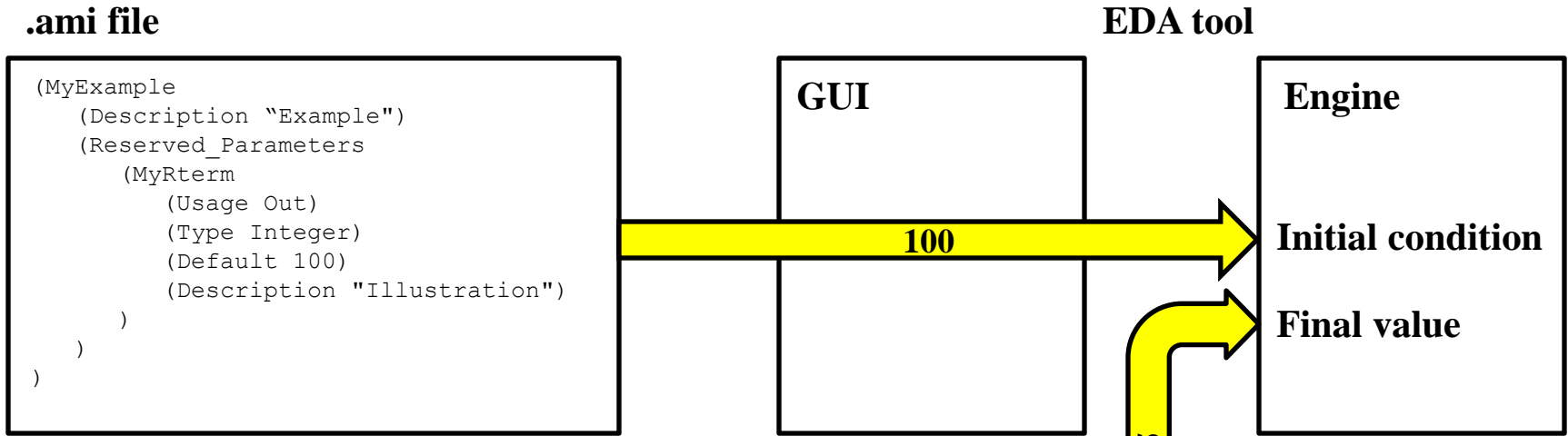
EDA tool

GUI

Engine

100

Illegal

OK

105

AMI model

```
(MyExample
    (MyRterm 105)
)
```

Since "**Parameter is Output only from executable**", the value of 100 in the .ami file should not be passed into the EDA tool's engine.

Why is it there then?
Confusing…

Example 2

.ami file

EDA tool

```
(MyExample
    (Description "Example")
    (Reserved_Parameters
        (MyRterm
            (Usage Out)
            (Type Integer)
            (Default 100)
            (Description "Illustration")
        )
    )
)
```

GUI

Engine

100

Initial condition

Final value

105

AMI model

```
(MyExample
    (MyRterm 105)
)
```

Since "**Parameter is Output only from executable**", what is Default 100 used for?

Should it be used as a default, i.e. initial condition in the EDA engine while waiting for the model to return the value 105?

The spec doesn't say anything about this.

Example 3a

.ami file
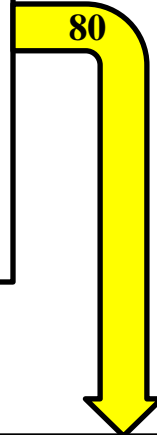
EDA tool

```
(MyExample
    (Description "Example")
    (Reserved_Parameters
        (MyRterm
            (Usage In)
            (Type Integer)
            (List 80 90 100 110 120)
            (Description "Illustration")
        )
    )
)
```

List →

GUI

List is presented to the user. If they do not make a selection, 80 will be passed to the model.

80

In this example, <typ value> is used if the user doesn't make a selection.

AMI model

Example 3b

.ami file

EDA tool

```
(MyExample
    (Description "Example")
    (Reserved_Parameters
        (MyRterm
            (Usage In)
            (Type Integer)
            (List 80 90 100 110 120)
            (Default 100)
            (Description "Illustration")
        )
    )
)
```

List

GUI

List is presented to the user. If they do not make a selection, 100 will be passed to the model.
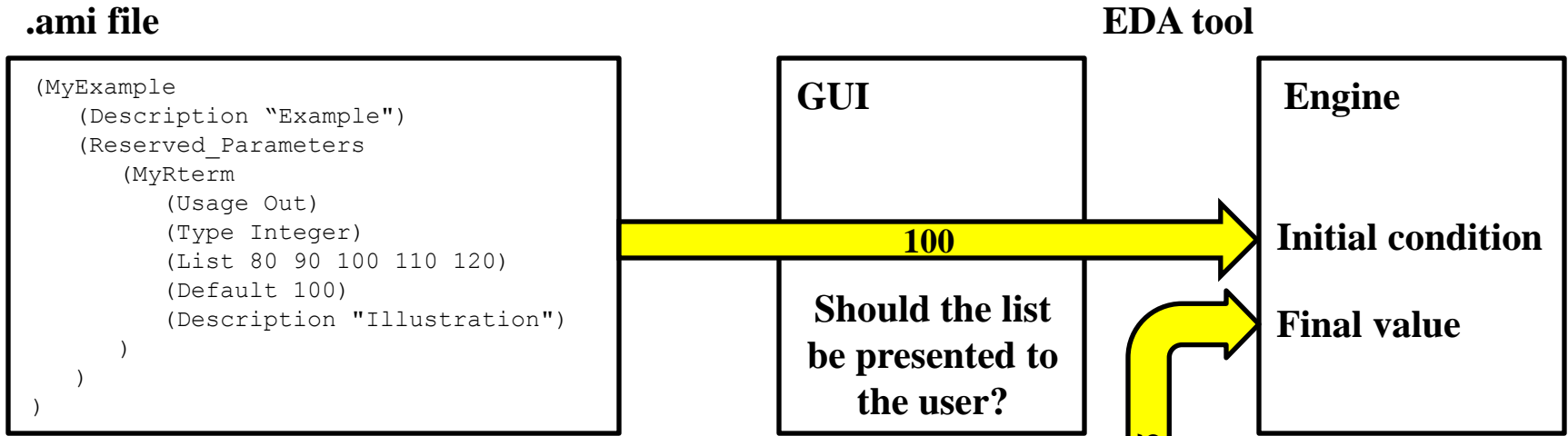
100

AMI model

In this example, Default is used for picking a value from the list if the user doesn't do that.

Note that the meaning of "Default" is different here than in example #2.

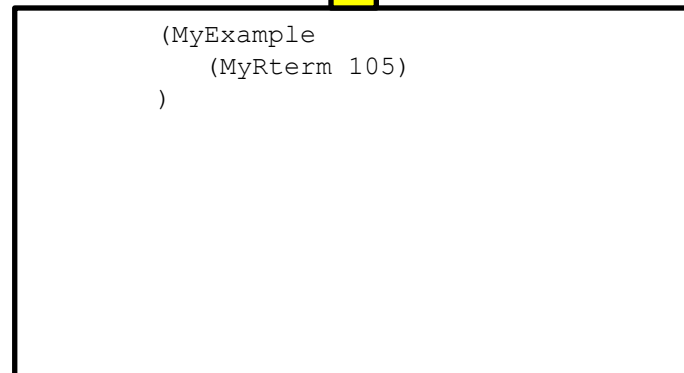**The meaning of Default is not defined in the spec.**

Example 4

.ami file

EDA tool

```
(MyExample
    (Description "Example")
    (Reserved_Parameters
        (MyRterm
            (Usage Out)
            (Type Integer)
            (List 80 90 100 110 120)
            (Default 100)
            (Description "Illustration")
        )
    )
)
```

GUI

Should the list be presented to the user?

Engine

100

Initial condition

Final value

105

AMI model

```
(MyExample
    (MyRterm 105)
)
```

Since "**Parameter is Output only from executable**", what is Default 100 used for here? It seems that in this example Default will aid in picking a value from the list if the user doesn't do that.
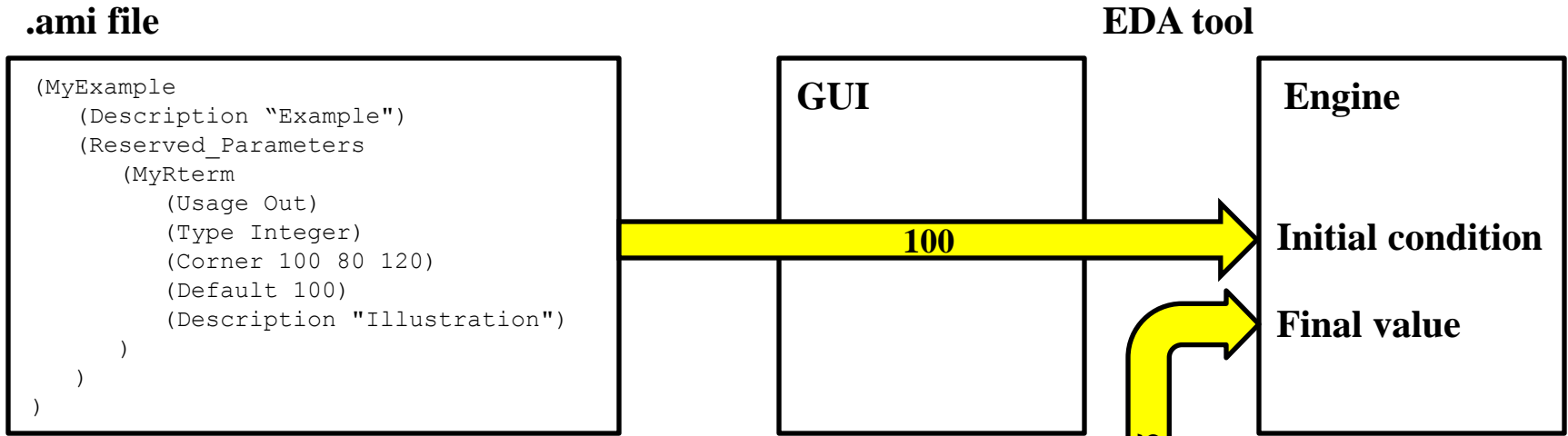
But why are we picking a value from a list if the value comes from the model? Should the EDA tool let the user pick a value from the list for the initial condition?

Or should the tool check the returned value against the list to make sure there is a match?

Example 5

.ami file

EDA tool

```
(MyExample
    (Description "Example")
    (Reserved_Parameters
        (MyRterm
            (Usage Out)
            (Type Integer)
            (Corner 100 80 120)
            (Default 100)
            (Description "Illustration")
        )
    )
)
```

GUI

Engine

100

Initial condition

Final value

105

AMI model

```
(MyExample
    (MyRterm 105)
)
```

Since "**The selection of one value is automatically carried out by the EDA tool based on its internal simulation corner setting**" (BIRD 140.2) , what is Default 100 used for here? (It shouldn't be allowed as a selector)…

How does the AMI model know about what the EDA tool's internal simulation corner is to return a value corresponding to that? (Another input parameter carrying that information could solve that, but that can be done without using Corner).

Is this also supposed to be used as an initial condition? Should the tool check the returned value against the list to make sure there is a match?

Problem summary

The ambiguities described on the previous slides can lead to different interpretations and assumptions by the EDA vendors and/or model makers

This can lead to loosing portability and interoperability

The IBIS specification should define the meaning(s) of "Default" and spell out some rules (expectations) on how the various Format types of Usage Out parameters should be handled