**BUFFER ISSUE RESOLUTION DOCUMENT (BIRD)**

**BIRD NUMBER:** 217

**ISSUE TITLE:** Require Clocked Rx Models to Return Clock Times

**REQUESTOR:**  Arpad Muranyi, Siemens EDA

**DATE SUBMITTED:** January 18, 2022

**DATE REVISED:**

**DATE ACCEPTED:** March 11, 2022

**DEFINITION OF THE ISSUE:**

According to the IBIS v7.1 specification, AMI models are not required to return valid clock times in the clock\_times vector (pg. 229). In the absence of clock times, the EDA tool can apply its own CDR to the signal relatively easily to generate its own clock times (although it is questionable whether the EDA tool’s CDR will behave the same way as the CDR of the actual device).

However, in the case of clocked Rx AMI models, it does not make sense to expect the EDA tool to derive the clock times from the clocked Rx AMI model’s output waveform with a CDR when the clocked Rx AMI model doesn’t return clock times. In addition, it is not advisable to use the clock input of the clocked Rx AMI model either because the clocked Rx AMI model may modify those clock times internally. For these reasons it seems that the only acceptable solution is to make it required for the clocked Rx AMI models to always return valid clock times in the clock\_times vector for the EDA tool.

**SUMMARY OF PROPOSED CHANGES:**

Add text to the IBIS specification to make it required for clocked Rx AMI models to always return valid clock times in the clock\_times vector.

**PROPOSED CHANGES:**

On pg. 229, replace the following text:

“Vector to return clock times. The clock times are referenced to the start of the simulation (the first AMI\_GetWave call). The clock\_times vector is allocated by the EDA tool and is guaranteed to be greater than the number of clocks expected during the AMI\_GetWave call. The clock times are exactly symbol\_time/2 before the input data signal is sampled. The algorithmic model will return non-negative clock\_times values, and place -1 after the last valid clock tick in the clock\_times vector during each AMI\_GetWave call. If there are no valid clock ticks for the duration of an AMI\_GetWave call, a single entry of -1 will be returned in the clock\_times vector. The units of clock\_times are seconds.”

With:

“Vector to return clock times. The clock times are referenced to the start of the simulation (the first AMI\_GetWave call). The clock\_times vector is allocated by the EDA tool and is guaranteed to be greater than the number of clocks expected during the AMI\_GetWave call. The clock times are exactly symbol\_time/2 before the input data signal is sampled. The algorithmic model will return non-negative clock\_times values, and place -1 after the last valid clock tick in the clock\_times vector during each AMI\_GetWave call. If there are no valid clock ticks for the duration of an AMI\_GetWave call, a single entry of -1 will be returned in the clock\_times vector. If an Rx AMI\_GetWave only returns -1 during all AMI\_GetWave calls then the model does not generate clock times.

Except for Redriver receiver models, it is highly recommended that all receiver models return valid clock times. A receiver model that specifies the Rx\_Use\_Clock\_Input parameter must return valid clock times. The units of clock\_times are seconds.”

On pg. 229, remove the sentence at the end of the following text:

“Although clock\_times will generally be related to the unit interval for the primary SerDes channel being simulated, there is no requirement that there be any relationship between the clock ticks generated by clock\_times and the actual waveform returned in the primary channel. It is possible for the CDR to go out of lock, resulting in clock ticks that have no definite relationship to the output wave. It is possible for the CDR to be suppressed for an undefined number of bits until the output of the first clock tick. ~~In the case of a receiver without a CDR, it is possible for only -1 to ever be output during all AMI\_GetWave calls.~~”

On pg. 252, replace the following text:

“If omitted, the EDA tool when in the AMI\_Init flow will have to determine the receiver decision time on its own.”

With:

“While it is highly recommended to include the Rx\_Decision\_Time parameter, if omitted, the EDA tool when in the AMI\_Init flow will have to determine the receiver decision time on its own.”

**BACKGROUND INFORMATION/HISTORY:**

The Advanced Technology Modeling Task Group discussed this topic on January 5, 2022 and agreed that a BIRD should be written to make it required for clocked Rx AMI models to return clock times. It was also suggested that text should be added to discourage model makers from not returning clock times in normal SerDes models and to add text to highly recommend the usage of the new reserved parameter Rx\_Decision\_Time.