Introducing IBIS 7.2

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Agenda

- History
- Summary of Changes in IBIS 7.2
- Technical Change: Reference Flow Improvements
- Technical Change: PAMn
- Clocking and Other Clarifications
- Wrap Up
History

- IBIS 7.1 was approved December 10, 2021
  - Two BIRDs were still open and unapproved at this point

- IBIS Editorial Task Group re-convened August 17, 2022
  - Known Issues and Draft 0 documents made available then

- Final Draft (#7) distributed January 18, 2023

- Approved as IBIS 7.2 January 27, 2023

Entire IBIS document revision flow took 163 days!
Changes in IBIS 7.2

- Technical Changes
  - BIRD211.4 IBIS AMI Reference Flow Improvements
  - BIRD213.1 Extending IBIS-AMI for PAMn Analysis
  - BIRD217 Require Clocked Rx Models to Return Clock Times

- Clarifications
  - BIRD219.1 AMI Parameter Root Name Clarifications
  - BIRD221 AMI_parameters_in Clarification
  - BIRD222 Clock Times Clarifications

- Other
  - BIRD216 Alphanumeric Pin Names
  - BIRD218 Designator Pin List Relaxation

Visit https://ibis.org/birds/ for complete text
Reference Flow Changes

- Repeater (viz. Redriver) flows have been clarified
  - Changes to the pre-Redriver channel response and the Redriver device itself should appear at the final Rx device during AMI_Init
  - Defines new reserved parameter `Tx_Impulse_Input` to identify what the AMI_Init impulse response includes
PAMn

- IBIS 7.1 supports PAM4
  - Four independent signaling levels in the same bit-time
  - For context, NRZ is “PAM2”

- PAMn is the general case, to help future-proof IBIS
  - USB 4.0 targets PAM3; other PAM variations are likely in future

- The changes in IBIS 7.2 support older PAM4 parameters for backwards-compatibility while creating expanded alternatives
  - New parameters Modulation_Levels, PAM_Thresholds, and PAM_Offsets
  - Thresholds indicate voltage levels for symbols, while offsets modify sampling
  - Thresholds and Offsets are outputs from the RX model to the EDA tool

IBIS 7.2 generalizes PAM for an unbounded number of levels
Clocked Model Changes

- IBIS 7.1 introduced clocked AMI models
  - Intended for single-ended (DDR) support
  - Defines clock AMI models and supports using clock information to latch data into models in the same simulation
  - In 7.2, these clock models must provide clock time outputs

- Ambiguities in IBIS 7.1 clarified in 7.2
  - The `clock_times` argument of `AMI_GetWave` can actually be an output or an input
    
    As an input, Wave or Times may be used as specified in `Rx_Use_Clock_Input`

IBIS 7.2 adds significant detail to clocked AMI approach
Other Clarifications and Improvements

- Root Names in AMI files and executables shall match

  \( \text{(my\_rx\_model} \ldots \\text{rx.ami} \) \rightarrow \text{(my\_rx\_model} \ldots \text{rx.dll/.so output to tool)}

- Tools should pass Usage In and InOut parameters/values to models (not all parameters)

- [Pin] names are only alphanumeric

- EMD [Designator Pin List]s need not list every pin on a component

... plus numerous minor grammatical and typographical improvements
Summary

- IBIS 7.2 has been approved as of January 27, 2023
  - … after just under six months of draft development

- Eight BIRDs included
  - First of these (BIRD211) submitted March 21, 2021
  - Last of these (BIRD222) approved December 9, 2022 (628 days)

- Next step: IBISCHK7, Version 7.2.0

Many thanks to the IBIS Editorial Task Group and the IBIS community for their fast work and active support!