IBIS Update

Mike LaBonte
Signal Integrity Software
Chair, IBIS Open Forum

IEEE SPI 2017 IBIS Summit
Baveno, Italy
May 10, 2017

http://www.ibis.org/
25 IBIS Members

Number of Members by Year

IBIS Update
IBIS Officers 2016-2017

Chair: Mike LaBonte, Signal Integrity Software
Vice-Chair: Lance Wang, IO Methodology Inc.
Secretary: Randy Wolff, Micron Technology
Treasurer: Bob Ross, Teraspeed Labs
Librarian: Anders Ekholm, Ericsson
Postmaster: Curtis Clark, ANSYS
Webmaster: Mike LaBonte, Signal Integrity Software

2017 Officer Election nominations open May 17
IBIS Meetings

• Weekly teleconferences
  – Quality Task Group (Tuesdays)
  – Advanced Technology Modeling Task Group (Tuesdays)
  – Interconnect Task Group (Wednesdays)
  – Editorial Task Group (some Fridays)

• IBIS Open Forum teleconference every 3 weeks
  – 451 meetings so far

• IBIS Summit meetings: DesignCon, SPI, Shanghai, Taipei, Tokyo, EPEPS?, EDI-CON USA?
SAE ITC

• SAE Industry Technologies Consortia is the parent organization of the IBIS Open Forum
• IBIS is assisted by SAE employees Thomas Munns, Phyllis Gross, Dorothy Lloyd
• SAE ITC provides financial, legal, and other services
• [http://itc.sae.org/](http://itc.sae.org/)
Task Groups

• **Interconnect Task Group**
  – Chair: Michael Mirmak
  – Develop on-die/package/module/connector interconnect modeling BIRDs

• **Advanced Technology Modeling Task Group**
  – Chair: Arpad Muranyi
  – Develop most other technical BIRDs

• **Quality Task Group**
  – Chair: Mike LaBonte
  – Oversee IBISCHK parser testing and development

• **Editorial Task Group**
  – Chair: Michael Mirmak
  – Produce IBIS Specification documents
IBIS Milestones

I/O Buffer Information Specification

• 1993-1994 **IBIS 1.0-2.1:**
  – Behavioral buffer model (fast simulation)
  – Component pin map (easy EDA import)
• 1997-1999 **IBIS 3.0-3.2:**
  – Package models
  – Electrical Board Description (EBD)
  – Dynamic buffers
• 2002-2006 **IBIS 4.0-4.2:**
  – Receiver models
  – AMS languages
• 2007-2012 **IBIS 5.0-5.1:**
  – IBIS-AMI SerDes models
  – Power aware
• 2013-2015 **IBIS 6.0-6.1:**
  – PAM4 multi-level signaling
  – Power delivery package models
• 2017? **IBIS 7.0**

Other Work

• 1995: **ANSI/EIA-656**
  – IBIS 2.1
• 1999: **ANSI/EIA-656-A**
  – IBIS 3.2
• 2001: **IEC 62014-1**
  – IBIS 3.2
• 2003: **ICM 1.0**
  – Interconnect Model Specification
• 2006: **ANSI/EIA-656-B**
  – IBIS 4.2
• 2009: **Touchstone® 2.0**
• 2011: **IBIS-ISS 1.0**
  – Interconnect SPICE Subcircuit specification

Current development
As of 10-May-2017
## Possible IBIS 7.0 Timeline

<table>
<thead>
<tr>
<th>Meeting Date</th>
<th>Milestone</th>
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<tbody>
<tr>
<td>4/21/2017</td>
<td>Vote to establish 7.0 as the next IBIS version passes</td>
</tr>
<tr>
<td>5/12/2017</td>
<td>BIRD review and acceptance</td>
</tr>
<tr>
<td>6/2/2017</td>
<td>BIRD review and acceptance</td>
</tr>
<tr>
<td>6/23/2017</td>
<td>BIRD review and acceptance</td>
</tr>
<tr>
<td>7/14/2017</td>
<td>Vote to approve 7.0 BIRD set is scheduled for next meeting</td>
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<tr>
<td>8/4/2017</td>
<td>7.0 BIRD set accepted. Editorial work begins</td>
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<tr>
<td>8/25/2017</td>
<td></td>
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<tr>
<td>9/15/2017</td>
<td></td>
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<tr>
<td>10/6/2017</td>
<td>Editorial announces 7.0 ready. Review period begins</td>
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<tr>
<td>10/27/2017</td>
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<tr>
<td>11/17/2017</td>
<td>Vote to ratify 7.0 scheduled for next meeting</td>
</tr>
<tr>
<td>12/8/2017</td>
<td>7.0 ratified</td>
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BIRDS Possibly Included in IBIS 7.0

<table>
<thead>
<tr>
<th>BIRD</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>147.6</td>
<td>Back-channel Support</td>
</tr>
<tr>
<td>158.5</td>
<td>AMI Ts4file Analog Buffer Models</td>
</tr>
<tr>
<td>166.2</td>
<td>Resolving problems with Redriver Init Flow</td>
</tr>
<tr>
<td>179</td>
<td>New IBIS-AMI Reserved Parameter Special_Param_Names</td>
</tr>
<tr>
<td>180</td>
<td>Require Unique Pin Names in [Pin]</td>
</tr>
<tr>
<td>182</td>
<td>POWER and GND [Pin] signal_name as [Pin Mapping] bus_label</td>
</tr>
<tr>
<td>183</td>
<td>[Model Data] Matrix Subparameter Terminology Correction</td>
</tr>
<tr>
<td>184.2</td>
<td>Model_name and Signal_name Restriction for POWER and GND Pins</td>
</tr>
<tr>
<td>185.2</td>
<td>Section 3 Reserved Word Guideline Update</td>
</tr>
<tr>
<td>186.3</td>
<td>File Naming Rules</td>
</tr>
<tr>
<td>187.3</td>
<td>Format and Usage Out Clarifications</td>
</tr>
<tr>
<td>188.1</td>
<td>Expanded Rx Noise Support for AMI</td>
</tr>
<tr>
<td>189.3</td>
<td>Interconnect Modeling Using IBIS-ISS and Touchstone</td>
</tr>
</tbody>
</table>

Green = currently accepted BIRD
# BIRDs Possibly Excluded from IBIS 7.0

<table>
<thead>
<tr>
<th>BIRD</th>
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</tr>
</thead>
<tbody>
<tr>
<td>125.1</td>
<td>Make IBIS-ISS Available for IBIS Package Modeling</td>
</tr>
<tr>
<td>145.3</td>
<td>Cascading IBIS I/O buffers with [External Circuit]s using the [Model Call] keyword</td>
</tr>
<tr>
<td>161.1</td>
<td>Supporting Incomplete and Buffer-only [Component] Descriptions</td>
</tr>
<tr>
<td>163</td>
<td>Instantiating and Connecting [External Circuit] Package Models with [Circuit Call]</td>
</tr>
<tr>
<td>164</td>
<td>Allowing Package Models to be defined in [External Circuit]</td>
</tr>
<tr>
<td>165</td>
<td>Parameter Passing Improvements for [External Circuit]s</td>
</tr>
<tr>
<td>181.1</td>
<td>I-V Table Clarifications</td>
</tr>
</tbody>
</table>

White = currently not an accepted BIRD
BIRD 147.6, Back-channel Support

• Enable back-channel link training messages between the Tx and Rx executable models to enable link training to optimize equalization settings during time domain (AMI_GetWave) simulations.

• New AMI Parameters:
  – BCI_Protocol, BCI_State, BCI_ID, BCI_Message_Interval_UI, BCI_Training_UI
Link Training Back-channel

**Stimulus**
- **Tx**
  - Init
  - GetWave
- **Channel**
- **Rx**
  - GetWave
  - Init

**BCI State**
- **Training Start**
- **Training Stop**
- **Initial Tx Settings**
- **Initial Rx Settings**
- **Back-channel File**: `<BCI_ID>_PCIe3g.dat`

**Specifications**
- **BCI Protocol**: "PCIe3g"
- **Tx AMI Parameters**
- **Rx AMI Parameters**

**EDA Tool**
- **AMI Models**
- **Protocol-specific message files**

**Clock Ticks**
- **Waveform**

**IBIS Update**
BIRD 158.5, AMI Ts4file Analog Buffer Models

- Touchstone on-die analog models for IBIS-AMI models directly included from the AMI file, bypassing the analog model in the IBIS file.
- Same as “TStoneFile” models, now “Ts4file”.

Specification Development
BIRD 188.1, Expanded Rx Noise Support for AMI

- Bounded (uniform) Rx Noise must be supported by IBIS-AMI, separately from the existing Gaussian random Rx Noise parameter.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rx_Noise, Rx_GaussianNoise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required:</td>
<td>No, and Rx_Noise is illegal before AMI_Version 6.0;</td>
</tr>
<tr>
<td></td>
<td>Rx_GaussianNoise is illegal before AMI_Version 6.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rx_UniformNoise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required:</td>
<td>No, and illegal before AMI_Version 6.2</td>
</tr>
</tbody>
</table>
BIRD 189.3, Interconnect Modeling Using IBIS-ISS and Touchstone

[Interconnect Model Set] Full_ISS_buf_pad_pin_PDN_4

[Interconnect Model] Full_ISS_pad_pin_IO
File_IBIS-ISS full_pad_pin_io.iss full_pad_pin_IO_typ
Number of terminals = 8
1 Pin_Rail pin_name 1 | VCC_5.0 POWER
2 Pin_Rail pin_name 2 | VCC_3.3 POWER
3 Pin_I/O pin_name 3 | DATA1 DATA_MODEL
4 Pin_Rail pin_name 4 | VSS GND
5 Pad_Rail pad_name VCC1 | VCC_5.0 POWER
6 Pad_Rail pad_name VCC2 | VCC_3.3 POWER
7 Pad_I/O pin_name 3 | DATA1 DATA_MODEL
8 Pad_Rail pad_name VSS1 | VSS GND
[End Interconnect Model]

[Interconnect Model] Full_ISS_buf_pad_IO
File_TS full_buf_pad_io.s8p full_buf_pad_IO_typ
Number of terminals = 8
1 Pad_Rail pad_name VCC1 | VCC_5.0 POWER
2 Pad_Rail pad_name VCC2 | VCC_3.3 POWER
3 Pad_I/O pin_name 3 | DATA1 DATA_MODEL
4 Pad_Rail pad_name VSS1 | VSS GND
5 Buffer_Rail pin_name 1 | VCC_5.0 POWER
6 Buffer_Rail pin_name 2 | VCC_3.3 POWER
7 Buffer_I/O pin_name 3 | DATA1 DATA_MODEL
8 Buffer_Rail pin_name 4 | VSS GND
[End Interconnect Model]

[End Interconnect Model Set]
[Thank You]

IBIS Open Forum:
Web: http://www.ibis.org
Email: ibis-info@freelists.org

We welcome participation by all IBIS model makers, EDA tool vendors, IBIS model users, and interested parties.