IBIS Open Forum Summit Minutes

Meeting Date: **February 5, 2009**

GEIA STANDARDS BALLOT VOTING STATUS
See last page of the minutes for the voting status of all member companies.

VOTING MEMBERS AND 2009 PARTICIPANTS

Actel	(Prabhu Mohan)
Agilent	Yutao Hu*, Fangyi Rao*
AMD	(Jonathan Dowling)
Ansoft Corporation	(Eldon Staggs)
Apple Computer	(Matt Herndon)
Applied Simulation Technology	(Fred Balistreri)
ARM	V. Muniswara Reddy*
Cadence Design Systems	Terry Jernberg*, Ambrish Varma*
Cisco Systems	Luis Boluna*, Tram Bui*, Bill Chen*, Syed Huq*, Mike LaBonte, Pedo Miran*, Huyen Pham*, AbdulRahman (Abbey) Rafiq*, Ashwin Vasudevan*, Zhiping Yang*
Ericsson	Anders Ekholm*
Freescale	Jon Burnett*, Om Mandhama*
Green Streak Programs	(Lynne Green)
Hitachi ULSI Systems	(Kazuyoshi Shoji)
Huawei Technologies	Xiaoqing Dong*, Chunxing Huang*
IBM	Adge Hawes
Infineon Technologies AG	(Christian Sporrer)
Intel Corporation	Michael Mirmak*, Jon Powell*, Sirisha Prayaga*
LSI	Brian Burdick
Marvell Semiconductor	(Itzik Peleg)
Mentor Graphics	Weston Beal*, Vladimir Dmitriev-Zdorov*, Zhen Mu*, Arpad Muranyi
Micron Technology	Randy Wolff
Nokia Siemens Networks GmbH	Eckhard Lenski
Samtec	(Corey Kimble)
Signal Integrity Software	Barry Katz*, Walter Katz*, Todd Westerhoff*
Sigrity	Sam Chitwood*
Synopsys	Ted Mido*
Teraspeed Consulting Group	Bob Ross*
Texas Instruments	Pavani Jella
Toshiba	(Yasumasa Kondo)
Xilinx	David Banas*
ZTE	(Ying Xiong)
Zuken	(Michael Schaeder)

OTHER PARTICIPANTS IN 2009

AET	Mikio Kiyono*
Bayside Design	Stephen Coe*, Elliot Nahas*
Circuit Spectrum	Zaven Tashjian*
CST	Antonio Ciccomancini*, Martin Schauem*
Curtiss-Wright Embedded Computing	J. Phillips*
EM Integrity	Guy de Burgh*
Exar	Helen Nguyen*
GEIA	(Chris Denham)
IO Methodology	Li (Kathy) Chen*, Lance Wang*, Zhi (Benny) Yan*
Juniper	Kevin Ko*
Leventhal Design & Communications	Roy Leventhal*
Mindspeed Technologies	Bobby Alkay*
NetLogic Microsystems	Eric Hsu*
Sanmina SCI	Vladimir Drivanenko*
Sedona International	Joe Socha*
Signal Consulting Group	Timothy Coyle*, Nicole Mitchell*
Simberian	Yuriy Shlepnev*
Xsigo Systems	Robert Badel*
Independent	Ian Dodd*

In the list above, attendees at the meeting are indicated by *. Principal members or other active members who have not attended are in parentheses. Participants who no longer are in the organization are in square brackets.

UPCOMING MEETINGS

The bridge numbers for future IBIS teleconferences are as follows:

Date	Telephone Number	Meeting ID
February 20, 2009	1-866-432-9903	121836136
April 23, 2009	-- IBIS Summit at DATE; no teleconference --	

All teleconference meetings are 8:00 AM to 9:55 AM US Pacific Time. Meeting agendas are typically distributed seven days before each Open Forum. Minutes are typically distributed within seven days of the corresponding meeting. When calling into the meeting, press 1 to attend the meeting, then follow the prompts to enter the meeting ID. For new, local international dial-in numbers, please reference the bridge numbers provided by Cisco Systems at the following link:

http://www.cisco.com/web/about/doing_business/conferencing/index.html

NOTE: "AR" = Action Required.

INTRODUCTIONS AND MEETING QUORUM
The IBIS Open Forum Summit was held in Santa Clara, California at the Santa Clara Convention Center during the 2009 DesignCon Conference. About 55 people representing 32 organizations attended.

The notes below capture some of the content and discussions. The meeting presentations and other documents are available at:

http://www.eda-stds.org/ibis/summits/feb09/

Michael Mirmak opened the meeting by welcoming the attendees. He thanked Cisco for sponsoring the event. He then asked people in the room to provide brief introductions for themselves.

CHAIR'S STATUS REPORT
Michael Mirmak, Intel Corporation
Michael highlighted several recent achievements. He noted approval of IBIS 5.0, making EMI, SSO and API support a reality in IBIS. IBIS Quality and ATM work continues apace, while Touchstone 2.0 is in final review with a vote likely before Q2'09. An IBIS parser bid packet and call for bids have been completed, with bidding to close March 1. An ICM parser update has been issued. Successful summits were held in Shanghai and Tokyo, and press attention to IBIS remains high. Mergers continue, with a final report on GEIA's status due at the DAC summit in July. 2008 closed with a positive budget and 32 members.   He closed with a brief set of statements on the state of the economy, noting that finances may force changes to summit plans and will drive strong appeals for parser funds as well as greater organizational focus. No questions were asked.

HOW IBIS MODELS RELATE TO SI, PI AND EMI-EMC
Roy Leventhal, Leventhal Design & Communications
Roy summarized how simulation of complex networks may produce improper results if too-simple buffer modeling assumptions, such as ramp-only transitions, are included. Similarly, insufficient or poor design may not result in poor SI behaviors, but may cause poor EMI effects (as SI designers may only be interested in $1/10^{th}$ or $1/50^{th}$ of the harmonic range of EMI designers). Roy showed several examples of physical tests and experiments where EMI effects can be mitigated through relatively simple design changes. 3D models and specialty simulators are indispensable for conducting serious studies of EMI. Laboratory tests may be conducted, though special attention must be paid to ground reference and loop effects.

EMI PARAMETERS FOR IBIS
Guy de Burgh, EM Integrity
Guy began by noting that interest in EMI (electromagnetic interference) was increasing and that little guidance existed for the new EMI parameters for far-field effects in IBIS 5.0. He summarized the new keywords for EMI in IBIS, covering device behaviors at the pin and component level. The model group of keywords covers connectors, though this may not be

clear from the IBIS text. Guy pointed to a development document, now available on-line, covering the motivation behind BIRD75, the source of the EMI parameters. He also pointed out several references for general EMI theory and far-field modeling approaches.

Guy concluded by asking about near-field support in IBIS, suggesting that additional keywords or other structures are needed to include these effects. A participant asked whether on-die effects were being probed, or whether at-pin impacts were the intended effects IBIS 5.0 EMI keywords model. Both Guy and several participants noted that on-die work was of interest to the industry and the IBIS community, but that no behavioral modeling solution has yet been developed.

MIXED MODE PARAMETER SUPPORT: DEFINITIONS AND TRANSFORMATIONS
Vladimir Dmitriev-Zdorov, Mentor Graphics
Vladimir began by stating that his presentation was intended to explain the kinds of mixed-mode concepts and methods used in the Touchstone 2.0 specification, now under development. He began by noting that network data, such as S-parameters, can be treated as matrices, combining vectors of inputs and outputs. Individual vector elements correspond to ports. Vladimir expanded on the port concept, noting that ports may be defined in multiple ways and do not necessarily correspond exactly to circuit nodes or terminals. He added that mixed-mode ports may also be defined in many ways, but they may not overlap (in other words, the same single-ended port could not appear in multiple mixed-mode port definitions).

Vladimir continued by noting that Touchstone 2.0 defines the ordering of the mixed-mode vectors, but does not define (and does not need to define) the actual arrangement of the matrix data, as the vectors will determine the eventual matrix arrangement. Permutation and conversion operations were defined for converting standard (or single-ended) network data to mixed-mode and back again. Vladimir closed by noting that basic checks, such as passivity, could still be applied to the mixed-mode data. Some conversions, such as mixed-mode Y to mixed-mode S, while not currently common in industry, could be uniquely defined under the approach he outlined.

PRIMER ON MIXED-MODE TRANSFORMATIONS IN DIFFERENTIAL INTERCONNECTS
Yuriy Shlepnev, Simberian
Yuriy began by reviewing the key concepts behind mode transformations (also called mode conversion in some sources). These are changes from differential- to common-mode signaling (or vice-versa), are usually undesirable, and can result from poor termination, routing issues or other physical effects. These can be represented through network parameters (most commonly S-parameters) in a number of different matrix forms. Symmetry in the physical relationships can be reflected in matrix symmetry, while a no-conversion condition will result from mirror symmetry along the plane of the interconnect. A number of different trace routing alternatives, with bends and varying lengths between them, were investigated through simulation, with examinations of losses and propagation delays. Several of these alternatives were studied in a physical board, with excellent correlation. In some cases, perfect physical symmetry cannot be ensured, so fiber weave and related effects may cause mismatches and therefore mode conversion. Yuriy concluded by summarizing the impact of mode conversion and a few of the best methods to mitigate its effects.

One participant asked whether mode conversion effects would be zeroed out only for one frequency or could be done for all frequencies if the impedance reference were made complex and frequency-dependent.

USING IBIS EBD FOR DDR2/DDR3 MODULE BOARD
Lance Wang, IO Methodology
Lance summarized the origin and intent of EBD (Electrical Board Description) files, and described several EBD usage models within the DDR family of technologies. EBD can describe point-to-point and fly-by topologies, as well as capacitive parallel terminations and resistive differential terminations. He also showed instances where EBD can be used for differential routes in DDR. Simulation waveforms showed good to excellent voltage correlation for several EBD implementations, but occasionally poor timing correlation.

A few participants noted that the current EBD usage was limited in a number of ways: frequency-dependent loss and inclusion of series capacitances. Walter Katz provided an explanation for the EMD proposals now in the ATM Task Group, which aim at improving on the EBD approach.

IBIS QUALITY AT XILINX – THE STATE OF THE ONION
David Banas, Xilinx
David summarized recent improvements in Xilinx quality efforts, including increasing V-t correlations between IBIS and transistor-level simulation results to 1000 points. The number of miscorrelations, in terms of rise and fall times fell dramatically. David also showed bench or lab measurements and how they compared to IBIS data, based on similar metrics of rise and fall times. Comparison to a "window" of IBIS behaviors, rather than a specific corner, was used for correlation. Margins showed that IBIS models generally defined the overall bounds for the lab data, although some cases showed slower results than predicted by IBIS. David concluded by noting that Xilinx models were passing specific IBIS Quality levels, and that automated correlation reports, containing similar data to that shown in his presentation, were now being provided along with the models. This is the first time much of this data has been publicly presented.

One participant asked whether the data being presented actually covered statistical variations within silicon production in high-volume. Additionally, would it be possible to document IBIS quality not as an absolute envelope but as a set of statistical boundaries.

IBIS DNA: DECODING THE QUALITY GENE
Timothy Coyle, Signal Consulting Group
Timothy began by noting that, through an informal survey of available IBIS models, approximately 59% had errors or other issues which would prevent their use for simulation. The majority (70%) was for IBIS 3.2 or later, with the same number released in the last three years. Even among the more recent models, a similar percentage had significant errors, with the major culprit being missing timing loads. By checking the models against level 2.0 of the IBIS Quality Checklist, only about 22% actually passed. Additional survey questions, directed at users, found that majorities believed IBIS mattered to them and made purchasing decisions based on quality, but were still seeing poor models. He concluded by suggesting that quality-assurance steps, such as using the parser, including [Test Data] information and correlating to lab and simulation data using a variety of loads, could help improve IBIS's reputation among users.

One participant asked about the specifics of individual errors and where they came from. Another participant asked whether many of the quality issues noted were really specification limitations. A cited example was USB, where only system-level, rather than buffer-level, evaluation parameters are provided, and Vref, Rref, etc. requirements are meaningless. As a result, this data is often left out or otherwise included but bogus, raising the error count.

CAPACITANCE COMPENSATION
Bob Ross, Teraspeed Consulting Group

Bob began by summarizing various situations where estimating or using C_comp is complicated by IBIS structures or features. In particular, [Driver Schedule] and differential buffers force use of C_comp which may not entirely accurately capture buffer behaviors. Bob mentioned several solutions described in earlier presentations, but noted two in detail: adjusting V-t tables and using C_fixture to account for capacitance effects. Adjusting V-t tables involves measurements and simulations both with and without package effects, then performing inverse linear transformations to estimate the die capacitance of the buffer. By modeling C_comp through the V-t table C_fixture value, accurate modeling of buffer behavior can be accomplished without any changes to existing K-coefficient algorithms. Bob concluded by noting that inconsistent support in industry tools may not make this a universal solution.

CREATING BROADBAND ANALOG MODELS FOR SERDES APPLICATIONS
Adge Hawes, IBM; Doug White, Cisco; Todd Westerhoff, Walter Katz, Signal Integrity Software

Todd began the presentation by briefly explaining the two aspects of the new IBIS 5.0 AMI approach. While algorithms for SerDes interfaces can be described by executable or DLL code under IBIS 5.0, the analog behaviors of buffers still rely on current IBIS techniques. Today's non-multi-lingual IBIS relies on a single value of C_comp which does not describe broadband, frequency- or voltage-dependent capacitances. Several methods have already been proposed to include this information, including networks of RC circuits or a variant on the EMD format. Under consideration now is a set of S-parameter data in series with voltage sources as stimulus. The S-parameter data could express many behaviors, even gain, with relative simplicity. Some tools and internal IC vendor approaches already incorporate this information, proving a clear industry need.

Michael Mirmak inquired whether the S-parameters need be causal and passive, as they would not be used in this case to describe interconnects. He added that the quality of current S-parameter data was relatively poor; suggesting that removing a quality check like passivity would not help promulgate good S-parameter data. Fangyi Rao noted that any bandwidth-limited model will show causality issues at some level. Bob Ross inquired whether S-parameter extraction procedures for die-level simulation were widely known.

OPEN DISCUSSION AND CONCLUDING ITEMS
Most open discussion was conducted during the question-and-answer period for Todd Westerhoff's presentation. No other questions were raised.

Michael Mirmak closed the meeting by thanking the participants, presenters and co-sponsors and reminding those present of the dates for the next summit and teleconference meetings.

The meeting was adjourned at approximately 4:50 PM.

NEXT MEETING
The next IBIS Open Forum teleconference will be held February 20, 2009 from 8:00 AM to 10:00 AM US Pacific Time. The next IBIS summit will take place at DATE on April 23, 2009. No teleconference has been arranged for the meeting.

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NOTES

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This meeting was conducted in accordance with the GEIA Legal Guides and GEIA Manual of Organization and Procedure.

The following e-mail addresses are used:

majordomo@eda-stds.org
> In the body, for the IBIS Open Forum Reflector:
> subscribe ibis <your e-mail address>

> In the body, for the IBIS Users' Group Reflector:
> subscribe ibis-users <your e-mail address>

> Help and other commands:
> help

ibis-request@eda-stds.org
> To join, change, or drop from either or both:
> IBIS Open Forum Reflector (ibis@eda-stds.org)
> IBIS Users' Group Reflector (ibis-users@eda-stds.org)
> State your request.

ibis-info@eda-stds.org
> To obtain general information about IBIS, to ask specific questions for individual response, and to inquire about joining the EIA-IBIS Open Forum as a full Member.

ibis@eda-stds.org
> To send a message to the general IBIS Open Forum Reflector. This is used mostly for IBIS Standardization business and future IBIS technical enhancements. Job posting information is not permitted.

ibis-users@eda-stds.org
> To send a message to the IBIS Users' Group Reflector. This is used mostly for IBIS clarification, current modeling issues, and general user concerns. Job posting information is not permitted.

ibis-bug@eda-stds.org
> To report ibischk parser BUGs. The BUG Report Form resides along with reported BUGs at:

> http://www.eda-stds.org/ibis/bugs/ibischk/
> http://www.eda-stds.org/ibis/bugs/ibischk/bugform.txt

icm-bug@eda-stds.org

       To report icmchk1 parser BUGs. The BUG Report Form resides along with reported BUGs at:

       http://www.eda-stds.org/ibis/icm_bugs/
       http://www.eda-stds.org/ibis/icm_bugs/icm_bugform.txt

To report s2ibis, s2ibis2 and s2iplt bugs, use the Bug Report Forms which reside at:

       http://www.eda-stds.org/ibis/bugs/s2ibis/bugs2i.txt
       http://www.eda-stds.org/ibis/bugs/s2ibis2/bugs2i2.txt
       http://www.eda-stds.org/ibis/bugs/s2iplt/bugsplt.txt

Information on IBIS technical contents, IBIS participants and actual IBIS models are available on the IBIS Home page:

       http://www.eigroup.org/ibis/ibis.htm

Check the IBIS file directory on eda.org for more information on previous discussions and results:

       http://www.eda-stds.org/ibis/directory.html

All eda.org documents can be accessed using a mirror:

       http://www.ibis-information.org

Note that the "/ibis" text should be removed from directory names when this URL mirror is used.

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GEIA STANDARDS BALLOT VOTING STATUS

I/O Buffer Information Specification Committee (IBIS)

Organization	Interest Category	Standards Ballot Voting Status	December 12, 2008	January 9, 2009	January 30, 2009	February 5, 2009
Actel	Producer	Inactive				
Advanced Micro Devices	Producer	Inactive	√			
Agilent Technologies	User	Inactive				√
Ansoft	User	Inactive				
Apple Computer	User	Inactive				
Applied Simulation Technology	User	Inactive				
ARM	Producer	Inactive				√
Cadence Design Systems	User	Inactive				√
Cisco Systems	User	Active	√	√	√	√
Ericsson	Producer	Inactive	√			√
Freescale	Producer	Inactive				√
Green Streak Programs	General Interest	Inactive				
Hitachi ULSI Systems	Producer	Inactive				
Huawei	User	Inactive	√			√
IBM	Producer	Active	√		√	
Infineon Technologies AG	Producer	Inactive				
Intel Corp.	Producer	Active	√	√	√	√
LSI	Producer	Active	√	√	√	
Marvell Semiconductor	Producer	Inactive				
Mentor Graphics	User	Active	√	√	√	√
Micron Technology	Producer	Active	√	√	√	
Nokia Siemens Networks	Producer	Active		√	√	
Samtec	Producer	Inactive				
Signal Integrity Software	User	Active	√		√	√
Sigrity	User	Active		√	√	√
Synopsys	User	Inactive				√
Teraspeed Consulting	General Interest	Active	√	√	√	√
Texas Instruments	Producer	Inactive	√	√		
Toshiba	Producer	Inactive				
Xilinx	Producer	Active	√	√	√	√
ZTE	User	Inactive				
Zuken	User	Inactive				

CRITERIA FOR MEMBER IN GOOD STANDING:

- MUST ATTEND TWO CONSECUTIVE MEETINGS TO ESTABLISH VOTING MEMBERSHIP
- MEMBERSHIP DUES CURRENT
- MUST NOT MISS TWO CONSECUTIVE MEETINGS

INTEREST CATEGORIES ASSOCIATED WITH GEIA BALLOT VOTING ARE:

- USERS - MEMBERS THAT UTILIZE ELECTRONIC EQUIPMENT TO PROVIDE SERVICES TO AN END USER.
- PRODUCERS - MEMBERS THAT SUPPLY ELECTRONIC EQUIPMENT.
- GENERAL INTEREST - MEMBERS ARE NEITHER PRODUCERS NOR USERS. THIS CATEGORY INCLUDES, BUT IS NOT LIMITED TO, GOVERNMENT, REGULATORY AGENCIES (STATE AND FEDERAL), RESEARCHERS, OTHER ORGANIZATIONS AND ASSOCIATIONS, AND/OR CONSUMERS.