IBIS Open Forum Minutes

Meeting Date: **June 7, 2011**
Meeting Location: **DAC IBIS Summit, San Diego, California**

VOTING MEMBERS AND 2011 PARTICIPANTS

Agilent	Radek Biernacki, Fangyi Rao, Amolak Badesha*
AMD	Nam Nguyen
Apple Computer	(Matt Herndon)
Applied Simulation Technology	Norio Matsui
Cadence Design Systems	Terry Jernberg, Ambrish Varma, Dennis Nagle, Martin Biehl, Yukio Masuko*
Cisco Systems	Syed Huq*, Mike LaBonte, Luis Boluna, Ashwin Vasudevan, Zhiping Yang
Ericsson	Anders Ekholm*
Freescale	(Jon Burnett)
Green Streak Programs	Lynne Green
IBM	Adge Hawes, Greg Edlund
Infineon Technologies AG	(Christian Sporrer)
Intel Corporation	Michael Mirmak*, Udy Shrivastava
IO Methodology	Lance Wang*
LSI	Brian Burdick
Mentor Graphics	Arpad Muranyi*, Ed Bartlett, Vladimir Dmitriev-Zdorov, Steve Kaufer, Chuck Ferry
Micron Technology	Randy Wolff, Andrea Spiezia, Roberto Izzi, Aniello Viscardi, Giovanni Guerra, Francesco Madonna, Giuseppe Fusillo
National Semiconductor	Hsinho Wu, Pegah Alavi, John Goldie
Nokia Siemens Networks GmbH	Eckhard Lenski
Signal Integrity Software	Walter Katz*, Todd Westerhoff*, Mike Steinberger, Barry Katz
Sigrity	Raymond Chen, Kumar Keshavan*, Yingxin Sun
Synopsys	Andy Tai, Ted Mido, Scott Wedge
Teraspeed Consulting Group	Bob Ross*, Kellee Crisafulli, Tom Dagostino, Scott McMorrow
Texas Instruments	Casey Morrison, Alfred Chong
Xilinx	(Raymond Anderson)
ZTE	(Huang Min)
Zuken	(Michael Schaeder)

OTHER PARTICIPANTS IN 2011

AET	Mikio Kiyono
Altera	Hui Fu, Zhuyuan Liu, Julia Nekrylova
Ansys (Ansoft Corporation)	Samuel Martens

ARM	(Nirav Patel)
Avago	Weiping He, Minh Quach, Sari Tocco
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Broadcom	Mohammad Ali
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Exar Corporation	Helen Nguyen
Granite River Labs	Johnson Tan, Mike Engbretson, Quintin Anderson
High Speed Design Center	Ben Chia
Huawei Technologies	Xiaoqing Dong
ICT-Lanto	Steven Wong
JEITA	Atsushi Ishikawa*
KEI Systems	Shinichi Maeda
Maxim Integrated Products	Hassan Rafat
Mindspeed	Jeff Li*, Lyn Wang*
NetLogic	Ryan Coutts*, Antonis Orphanou*
Oracle	Gustav Blando
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QLogic	David Choe*
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Samsung Electronics	Il Seong*
Siemens	Manfred Maurer
Simberian	Yuriy Shlepnev
ST Microelectronics	Fabio Brina, Alan Smith
TechAmerica	(Chris Denham)
Thales Communication	Alexandre Amedeo, Cyrip Chastang
Toshiba	(Yasumasa Kondo)
University of Illinois	Jose Schutt-Aine
University of L'Aquila	Danilo di Febo
Vitesse Semiconductor	Siris Tsang*
Independent	Yoichi Niioka

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	Meeting Number	Meeting Password
June 24, 2011	205 722 546	IBIS

For teleconference dial-in information, use the password at the following website:

https://cisco.webex.com/cisco/j.php?J=205722546

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, 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.

OFFICIAL OPENING

The IBIS Open Forum Summit at DAC was held in San Diego, California at the Omni Hotel. About 20 people representing 17 organizations attended.

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

http://www.eda.org/ibis/summits/jun11/

Michael Mirmak welcomed all the participants and thanked the co-sponsors Mentor Graphics and the IBIS Open Forum. He asked all the participants to introduce themselves.

IBIS IN REVIEW

Michael Mirmak, Intel Corp.

Michael Mirmak summarized the status of IBIS, as an organization, in terms of achievements and the goals for the coming months. Achievements include the issuing of a new IBISCHK5 parser, numerous BIRDs being filed and running several successful international events. IBIS finances are still slightly weak due to delayed renewals and reduced IBIS parser income. Michael noted that a reserve account will be established at TechAmerica that will carry funds from year-to-year. Additionally, TechAmerica's outreach efforts include implementing a KAVI-based system for balloting, meeting documents and the like.

For the immediate future, IBIS 5.1 and 5.2 development are critical. IBIS-ISS will likely be completed shortly, with IBIS editorial work being concluded thanks to the help of a TechAmerica technical writer. Additional organizational improvements are under consideration. Michael concluded by thanking the current officers and the participants in general.

Syed Huq asked whether we have to pay for KAVI in the future. Similarly, do we have to pay for the technical editor's services now? Michael noted that both of these were paid out of IBIS dues to TechAmerica and not as separate fees.

Arpad Muranyi asked for clarification of the word "review" regarding IBIS-ISS in the slides. He also suggested, as he did in 2010, that the officer vote be moved to DesignCon due to the larger number of attendees. Michael replied this may be possible, so long as our charter is updated to

take it into account. Kumar Keshavan suggested that KAVI balloting could also allow for online voting; Michael noted that DASC currently does this in its elections. Walter Katz suggested polling the IBIS membership and formally asked Michael as the chair to enable this to happen.

IBIS PDN FEATURE STUDIES
Randy Wolff, Micron Technology & Lance Wang, IO Methodology

Lance Wang presented a summary of studies performed on implementations of the new [Composite Current], [ISSO PD] and [ISSO PU] keywords as added in BIRD95 and BIRD98. General observations for [Composite Current] include the need to add additional time to V-t tables, which may limit overclocking applications. Some assumptions behind the keyword about pullup and pulldown reference currents may also be invalid. Based on comparisons to SPICE transistor-level and traditional IBIS simulations, using all these keywords can significantly improve power supply modeling accuracy and the combination is more accurate than use of BIRD95 or BIRD98 keywords alone. Some algorithms using the keywords may need improvement, including simulator truncation. Finally, IBISCHK may also need adjustment to prevent too-stringent checking of input data. Lance encouraged all simulators to include BIRD95/98 support.

Bob Ross asked whether the SPICE models were correlated, as the behavior was questionable. Lance responded that the simulators could not run even four SPICE buffer models together for SSO due to simulation limitations.

Anders Ekholm asked whether the shown I-t tables were generated using DC analysis. Lance answered that transient analysis was used. Arpad Muranyi suggested that the models were generated without package information, so oscillations should not result. Walter Katz asked whether the test cases involved lossy models, as a 2 GHz oscillation was visible. Kumar Keshavan suggested that a current vs. voltage or voltage vs. current macromodel might provide additional accuracy improvements.

Arpad added that an RLC "resonator" at the buffer might bleed through Miller capacitance into pre-driver to cause the issues seen in the waveforms. He noted also that the waveform activities in currents before the edge happens were disturbing.

IBIS-ATM TASK GROUP REPORT
Arpad Muranyi, Mentor Graphics Corp.

Arpad Muranyi provided a very brief summary of ongoing work in the IBIS-ATM (Advanced Technology Modeling) Task Group, towards IBIS 5.1 and/or 5.2. New analog BIRDs may include definitions for generating impulse responses, and will likely be part of IBIS 5.2. IBIS 5.1 will include, at a minimum, clarifications of key technical areas needed for IBIS-AMI operation. Arpad concluded by noting that the BIRDs highlighted in blue (128 and 131) are needed right away in the industry and have been introduced since DesignCon 2011.

COMPLIANT IBIS PACKAGE MODELS
COMPLIANT IBIS BUFFER MODELS

Walter Katz, Signal Integrity Software (SiSoft)

Walter Katz presented two related presentations on ensuring compliant IBIS package and buffer models. He defined compliance in terms of meeting the needs of industry and requirements of the relevant specifications and noted that he must literally wear "different hats" to consider the needs of the EDA vendor, the IBIS user and IBIS as an organization. For package models, he proposed not only supporting IBIS-ISS in IBIS, but allowing it at the [Package] and [Model] hierarchy levels, plus as part of EBD. Further, Walter proposed extending IBIS-ISS to support behavioral buffer modeling, also at the [Model] level, in a general-purpose language called IBIS-BSS. He suggested that the IBIS traditional approach creates a limitation on new parameters, versus the flexibility of IBIS-AMI structures (tables, etc.). By defining "intrinsic" circuit-level or Touchstone TX and RX circuit models for buffers, the analog behavior for the buffer can be included in or pointed to through IBIS-AMI. Intrinsic models are related to BIRD122, which may be replaced or withdrawn.

Kumar Keshavan noted that IBIS-AMI is increasingly handling more features. As a result, putting IBIS AMI as a language in any section of IBIS (as "IBIS-AMI anywhere") might make use and adoption easier. Walter responded that this kind of approach could work and would be like a "nose by any other name – it still smells".

COMPARISON OF THE RECENT ANALOG MODELING BIRD PROPOSALS

Arpad Muranyi, Mentor Graphics Corp.

Arpad Muranyi presented a detailed comparison of the various BIRD proposals linking IBIS to IBIS-ISS. He noted that the first part of his presentation should be considered an addendum to previous material discussed at DesignCon. Several detailed examples were given for offline review. Arpad explained how the [Pin Mapping] keyword can be used to tie the supply nodes of [External Model] or [Model] to specific pins through IBIS-ISS package models, as proposed in BIRD125 to support both new and legacy applications, with a minor change in BIRD125. Arpad summarized SiSoft's analog proposals, where analog models may be instantiated three different ways: 1) an intrinsic treatment, 2) from .ami files and 3) under an [External ISS] keyword pair from .ibs files.

Kumar Keshavan repeated his AMI suggestion from earlier, that IBIS-AMI code be supported anywhere within IBIS to address these issues.

Walter Katz observed that [External Model] assumes the input inside the device is a digital input but IBIS-AMI uses an analog input. Arpad replied that the D_to_A converters turn the digital input into analog signals before they are connected to the subcircuit. Walter also commented that Arpad’s usage of [Pin Mapping] would not support on-die interconnect modeling. Arpad responded that this could actually be done with the existing [Pin Mapping] keyword today for the supply connections of a [Model] or [External Model], and with a slight modification to [Pin Mapping] this could also be extended to the signal path. Arpad stated that he didn’t want to complicate the current discussion and BIRDs with this topic.

IBIS IN ACADEMIA

Bob Ross, Teraspeed Consulting Group

Bob Ross summarized the material on IBIS available in academia, including papers on the algorithms in IBIS, interactions with power delivery and EMC, and major conferences that include IBIS features. He added a few details regarding the historical understanding of IBIS, including that early IBIS papers in 2006 excluded C_comp with incorrect results. Further, the ICEM specification linked internationally with IBIS originally came from French EMI studies. Bob concluded by stating that IBIS is having an academic impact and updating the attendees on upcoming conferences. The SPI conference is now becoming a "Signal and Power Integrity" event, and that IBIS Summits in Europe are shifting to SPI and away from DATE. Bob also noted that EPEP in Santa Clara will be coming up soon and may be an IBIS Summit opportunity.

ELECTION OF OFFICERS

Michael Mirmak explained the nature of each of the IBIS board positions and asked for nominations for each. Syed Huq noted that Mike LaBonte was willing to serve as both Postmaster and Webmaster, which is not prohibited by IBIS rules. Bob Ross added that he was willing to act as "backup" to Mike should he be elected.

Without objection or other nominees being proposed, the nominees below were elected to serve as the IBIS Board for 2011-2012.

Chair:	Michael Mirmak, Intel Corp.
Vice-Chair:	Lance Wang, IO Methodology Inc.
Secretary:	Randy Wolff, Micron Technology
Model Librarian:	Anders Ekholm, Ericsson
Postmaster:	Mike LaBonte, Cisco Systems
Webmaster:	Mike LaBonte, Cisco Systems

Bob Ross presented each of the outgoing officers with a small gift, an IBIS mouse pad.

AMI MODELING METHODOLOGY AND MEASUREMENT CORRELATION OF A 6.25 GB/S LINK

Ryan Coutts, Antonis Orphanou and Manuel Luschas, NetLogic Microsystems
Amolak Badesha and Nilesh Kamdar, Agilent Technologies

Ryan Coutts presented an overview of the design, modeling and testing of a 6.25 Gb/s link, including the IBIS-AMI models used at either end. He noted that measurement and simulation are strongly connected, and that correlation provided insights on improving the simulation models. Key issues included non-linear behavior over emphasis settings causing poor initial correlation for maximized tap values. Sampling may drive a need to "turn up" the gain in the circuit. Improvements to the model to address non-linearity included using multiple tables. He noted that including a gain with 0 delay in a feedback loop will lead to instabilities (the model response "blows up"). As C code doesn't have inherent delay, this needs to be added explicitly.

Ryan also described the error counting mechanism used for validation in the lab, in the absence

of an on-die oscilloscope function. The receiver sampler can shift sampling in discrete steps, with failure arriving sharply on height-limited steps: 31 up/down voltage steps, with 356 timing steps, in a narrow range. The ultimate desire is to see PDFs (probability density functions) on the hip itself. PRBS 51 is the data pattern used for validation, as it shows resonances, with a pattern length of 2^15 -1. This translates to about 32 million bits, taking about 35 minutes of simulation.

IBIS-AMI doesn't support a random PDF of noise today, and therefore TX noise is simply jitter. No noise is included in the channel. In the future, Ryan noted that he would like to see differently-shaped eye templates (not rectangular ones) used for assessment of performance.

Todd Westerhoff asked whether Init or GetWave was used to model the chips. Ryan noted that an Init LTI model was used in addition to GetWave. Todd additionally asked whether there was random noise included in the RX model. Ryan replied that jitter was included through "clock_times".

Walter Katz and Ryan noted that one could report out a PDF and process it, providing it as an image, but that's not standard IBIS-AMI. This approach allows all simulators to take advantage of it.

Lyn Wang asked how the taps were found for the non-linear tables. Ryan answered that this was done through measurement of the 3-tap driver.

BIRD PROPOSAL: EXTENDING IBIS-AMI TO SUPPORT BACK-CHANNEL COMMUNICATIONS

Marcus Van Ierssel, Snowbush IP (Gennum)
Kumar Keshavan and Ken Willis, Sigrity
Walter Katz, Signal Integrity Software (SiSoft)

Kumar Keshavan presented on how back-channel communications may be supported in IBIS, particularly involving IBIS-AMI. Both PCI Express* and IEEE 802.3 KR allow interaction between a receiver and transmitter to decide optimum equalization quality. A key assumption is that backchannel operation is in real-time, with training. Statistical analysis is unaffected by or uninvolved with backchannel equalization; therefore only GetWave (bitstream) time-domain operations would be involved. Key data and parameters would need definition for both the TX and RX, through tables as a compact way to express test or training patterns. A common format was proposed, called a .BCI file, which standards committees could use to define how backchannel communications would be conducted in SI models. BIRDs to support this would modify AMI_Parameters_Out plus add new parameters. Kumar concluded by noting that questions remain on file format for .BCI, particularly who controls it, IBIS or the interface standards committee.

Michael Mirmak asked about PCI Express, where specific presets are exchanged but incrementing and decrementing as used in the proposal may not have meaning. Walter Katz added that PCIe 3.0 doesn't increment or decrement but indicates actual values to use. As a result, the proposal would have to establish many parameters for EDA tools in advance. Kumar added that this was an opportunity to involve the standards committees and get IBIS prominence. Bob Ross asked whether the BCI file was equivalent to an .AMI file, in terms of

format. Walter noted that it points to the same file (or no file), but they are different flows.

COMPLIANT IBIS-AMI MODELS

Walter Katz and Todd Westerhoff, Signal Integrity Software (SiSoft)

Walter Katz presented on the concept of IBIS-AMI compliance. At present, IBIS files may be checked by IBISCHK5 but IBIS-AMI DLLs use separate checking engines. In addition, Walter outlined the key portions of a full system simulation, and he outlined the ideas of interoperability, portability, speed, accuracy and functionality. He noted that statistical IBIS-AMI approaches trade-off accuracy vs. speed when compared to time-domain approaches. He also noted that models are not always complete, and that IBISCHK doesn't really ensure portability. External files can also cause a problem. Analog support is increasingly involving broadband models (Walter noted that he knew of "at least 2 IC vendors who only deliver broadband buffer models"). Walter concluded by summarizing proposed features and extensions not yet part of IBIS.

Michael Mirmak asked whether the flows outlined in the presentation assume a separate clock path as required. Walter indicated not. He also noted, in response to Ryan Coutts, that voltage and time are independent in the flow, and that a rectangular timing "box" for evaluation was not assumed. Kumar Keshavan added that doing something regarding analog clocks is taken care of inside EDA tools running the models. Further, RX noise is usually applied to the impulse response. Walter replied that noise just becomes a spectral density applied to the wave.

Ryan suggested finding ways of constraining the model to be useful; if an IBIS-AMI model takes longer than SPICE to run, it may not be useful. Kumar suggested that GetWave is the major issue here. Michael and Todd Westerhoff raised the issue of control of algorithms. IC vendors may believe that their analysis and budgeting techniques are unique and better than EDA assumptions, and therefore may not want to simply pass basic data to the EDA tool for analysis, but perform the analysis themselves in the DLL. Walter responded that the tool can report simply the BER, as part of AMI_Parameters_Out.

Kumar noted that EDA tools all support post-processing of jitter. Today, they will return waveforms and clock ticks (through GetWave but not Init). Todd added that AMI_Parameters_Out (char **) could include anything written to the disk, to support IC vendor needs as discussed, but that data management then becomes the problem. Walter replied that openings or mechanisms for reporting data out do exist. He concluded by noting the pleasant working relationship he and SiSoft have had with Kumar and Sigrity.

OPEN DISCUSSION

Michael Mirmak opened the floor for questions and discussion. Arpad Muranyi returned to the analog modeling and package discussion, noting that non-short connections are supported in [Pin Mapping] to support on-die interconnect modeling between the buffer’s terminals and die-pads. Walter Katz responded that companies model power delivery using on-die standard models and that one inconvenience of using existing keywords is that the pinlist still needs duplication in [Pin Mapping]. Arpad Muranyi noted that the on-die and package modeling is done with IBIS-ISS which is standard SPICE. Kumar Keshavan added that an "AMI anywhere"

approach can help solve this. Arpad wondered about support of old syntax already in the specification and whether IBIS-AMI would support that too. Kumar suggested that this would be a new, non-reserved general language. Arpad suggested that this would mean re-writing all of today's IBIS features, but Kumar disagreed. Walter pointed to IBIS-X as sections and files. Kumar added that the syntax would be wide open. Arpad summarized his approach as "what can we do with what we already have?"

Arpad suggested a side-by-side analog BIRD comparison. Anders Ekholm asked, from a user's perspective, what can't be done today and how do the proposals compare to what can't be done. Arpad responded that there's a lot of overlap between the proposals, due to IBIS-ISS details on instantiation. Walter added a question about analog buffer modeling, noting that acceptance of a BSS format would be easy, if the simple format similar to IBIS-ISS were maintained. Buffer models today are effectively intrinsic TX, RX, etc. A complication of a BSS approach is the general circuit with general port ordering support. Kumar responded that he is not in favor of a "canned" intrinsic model, as IBIS-AMI assumptions about circuits are inadequate.

Michael asked about limiting the complexity of the proposals – are manual processes or automatic processes used to create models? If models are machine-generated, who cares about the internal complexity of the structures? Walter responded that manual generation, to some extent, is needed to tie analog and AMI models together. Kumar suggested that most models are or will be machine-generated.

Todd Westerhoff noted that the industry is generally agreed on strategy: a parameterized analog model with links to packages. Arpad added that we are also trying to "get by" with minimum changes. Walter replied, in contrast, that his proposals, among others, are trying to define something new and clean. Todd added that we also have a problem with models having too many pieces.

Anders Ekholm asked about using S-parameters for non-AMI models. Walter responded that the issue is the TX input is assumed digital, while the output is analog in IBIS, while for RX, the input is analog, output is digital. Arpad replied that using [Pin Mapping] and D/A, A/D converters addresses this. He added that the alternative approach would only work for AMI. Walter suggested that BSS is needed for legacy feature support. Kumar suggested that some simulation tools are entirely analog in terms of output and stimulus, rather than a mix of digital and analog operations. Walter noted that his syntax does support this all-analog approach.

Michael raised some philosophical points on deprecation. How can the IBIS community make sure "new stuff" works with "old stuff"? Can deprecation work here? If not, can we limit old features to only certain (older) versions of IBIS? Can someone indicate the relative standard priority of new vs. old? Bob Ross noted that there's no reason to deprecate a keyword. A consequence of these discussions is the implication that, with deprecation, IBIS-AMI in IBIS 5.1 will be "perfect", as we are recovering from IBIS 5.0. Walter replied that deprecation as used in IBIS-AMI development was to fix a bug, not remove a feature. The general attitude is, "please don't deprecate because it will break my code." Adding "new stuff" is usually better in order to avoid modifying old code, although "writing stuff up is really painful." He suggested that the Interconnect Task Group should take up the analog BIRDs, while IBIS-ATM will decide where to go next on buffer interoperability.

CONCLUDING ITEMS

Michael Mirmak closed the meeting by thanking the co-sponsors and the presenters. He also thanked all the attendees for making the meeting a success. He noted the time and date of the next IBIS meeting. The meeting concluded at approximately 4:30 PM.

NEXT MEETING

The next IBIS Open Forum teleconference will be held June 24, 2011 from 8:00 to 10:00 AM US Pacific Standard Time. Votes on BIRD130 and BIRD134 are scheduled.

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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.org

In the body, for the IBIS Open Forum Reflector:
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In the body, for the IBIS Users' Group Reflector:
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Help and other commands:
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To join, change, or drop from either or both:
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IBIS Users' Group Reflector (ibis-users@eda.org)
State your request.

ibis-info@eda.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.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.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.org

To report ibischk parser BUGs as well as tschk2 parser BUGs. The BUG Report Form

for ibischk resides along with reported BUGs at:

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

The BUG Report Form for tschk2 resides along with reported BUGs at:

http://www.eda.org/ibis/tschk_bugs/
http://www.eda.org/ibis/tschk_bugs/bugform.txt

icm-bug@eda.org

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

http://www.eda.org/ibis/icm_bugs/
http://www.eda.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.org/ibis/bugs/s2ibis/bugs2i.txt
http://www.eda.org/ibis/bugs/s2ibis2/bugs2i2.txt
http://www.eda.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.eda.org/ibis

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

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

IBIS CURRENT MEMBER VOTING STATUS

I/O Buffer Information Specification Committee (IBIS)

Organization	Interest Category	Standards Ballot Voting Status	May 11, 2011	May 13, 2011	June 3, 2011	June 7, 2011
Advanced Micro Devices	Producer	Active	-	X	X	-
Agilent Technologies	User	Active	-	X	X	X
Apple Computer	User	Inactive	-	-	-	-
Applied Simulation Technology	User	Inactive	-	-	-	-
Cadence Design Systems	User	Active	X	X	-	X
Cisco Systems	User	Active	-	X	X	X
Ericsson	Producer	Active	X	-	X	X
Freescale	Producer	Inactive	-	-	-	-
Green Streak Programs	General Interest	Inactive	-	-	-	-
IBM	Producer	Active	-	X	X	-
Infineon Technologies AG	Producer	Inactive	-	-	-	-
Intel Corp.	Producer	Active	-	X	X	X
IO Methodology	User	Active	X	X	X	X
LSI	Producer	Active	-	X	X	-
Mentor Graphics	User	Active	-	X	X	X
Micron Technology	Producer	Active	X	-	X	-
National Semiconductor	Producer	Inactive	-	-	-	-
Nokia Siemens Networks	Producer	Active	-	X	X	-
Signal Integrity Software	User	Active	-	X	X	X
Sigrity	User	Inactive	-	-	-	X
Synopsys	User	Inactive	-	-	-	-
Teraspeed Consulting	General Interest	Active	X	X	X	X
Texas Instruments	Producer	Inactive	-	-	-	-
Xilinx	Producer	Inactive	-	-	-	-
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 TECHAMERICA BALLOT VOTING ARE:

- USERS - MEMBERS THAT UTILIZE ELECTRONIC EQUIPMENT TO PROVIDE SERVICES TO AN END USER.
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- 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.