



IBIS Open Forum Minutes

Meeting Date: **November 30, 2018**

Meeting Location: **Teleconference**

VOTING MEMBERS AND 2018 PARTICIPANTS

| | |
|-------------------------------|--|
| ANSYS | Curtis Clark, Miyo Kawata |
| Applied Simulation Technology | (Fred Balistreri) |
| Broadcom | (Yunong Gan) |
| Cadence Design Systems | Brad Brim*, Ken Willis, Ambrish Varma, Zhen Mu Morihiro Nakazato, Jinsong Hu, Skipper Liang Zuli Qin, Haisan Wang, Hui Wang, Yitong Wen Clark Wu, Zhangmin Zhong, Jessica Yen, Nemo Hsu |
| Cisco Systems | Stephen Scearce, Cassie Yan, Baosh Xu |
| CST | Stefan Paret |
| Ericsson | Anders Ekholm, Zilwan Mahmood, Guohua Wang Wenyan Xie, Amy Zhang |
| GLOBALFOUNDRIES | Steve Parker* |
| Huawei Technologies | (Hang (Paul) Yan) |
| IBM | Greg Edlund, Luis Armenta, Hubert Harrer Michael Cohen |
| Infineon Technologies AG | (Christian Sporrer) |
| Intel Corporation | Hsinho Wu*, Michael Mirmak*, Nilesh Dattani Fernando Mendoza Hernandez, Varun Gupta Subas Bastola, Hansel Dsilva, Gianni Signorini Kai Yuan, Denis Chen, Jimmy Hsu, Cucumber Lin |
| IO Methodology | Lance Wang* |
| Keysight Technologies | Radek Biernacki*, Ming Yan, Heidi Barnes Pegah Alavi, Toshinori Kageura, Satoshi Nakamizo Umekawa Mitsuharu |
| Maxim Integrated | Joe Engert, Yan Liang |
| Mentor, A Siemens Business | Arpad Muranyi*, Weston Beal, Raj Raghuram Carlo Bleu, Mikael Stahlberg, Yasushi Kondou Vladimir Dmitriev-Zdorov, Nitin Bhagwath Kazuhiro Kadota, Terence Guo |
| Micron Technology | Randy Wolff*, Justin Butterfield |
| Micron Memory Japan | Masayuki Honda, Tadaaki Yoshimura, Toshio Oki Mikio Sugawara |
| NXP | (John Burnett) |
| Raytheon | Joseph Aday |
| SiSoft | Mike LaBonte*, Walter Katz*, [Todd Westerhoff] |
| Synopsys | Ted Mido*, Adrien Auge, Scott Wedge, Xuefeng Chen |

Teraspeed Labs
Xilinx
ZTE Corporation
Zuken

Jinghua Huang, Yuyang Wang
Bob Ross*
Ravindra Gali
Shunlin Zhu, Liqiang Meng, Yonghui Ren, Bi Yi
Michael Schaefer, Takayuki Shiratori

OTHER PARTICIPANTS IN 2018

A&D Print Engineering Co.
Abeism Corporation
Alpine Electronics
AMD Japan
Apollo Giken Co.
ASRock Rack
ASUSTek Computer
Avnet
BasiCAE
Canon Components
Canon

Ryu Murota
Nobuyuki Kiyota, Noboru Kobayashi
Norio Mashiko
Tadashi Arai
Naoya Iisaka, Satoshi Endo
Eric Chien, Timmy Kao
Eric Hsieh, Nick KH Huang, Jenyung Li, Eric Tsai
Shinya Ishizuka
Kiki Li, Darcy Liu, Linda Zhang
Takeshi Nagata
Syoji Matsumoto, Yusuke Matsudo, Manabu Sakakibara
Tadashi Aoki, Hitoshi Matsuoka, Ryuta Kusaka
Masaaki Ohishi, Satoru Ishikawa

Casio Computer Co.
Celestica
CMK Products Corp.
Credo
Cybernet Systems
Denso Corp.
Eizo Corp.
Finnhan
Fuji Xerox Manufacturing Co.
Fujitsu Advanced Technologies
Fujitsu Interconnect Technologies
Fujitsu Ltd.
Fujitsu Optical Components
Genesis Technology
Gifu University
Global Unichip Japan
Google
Hamamatsu Photonics
Haskware
Hewlett Packard Enterprise
Hitachi ULSI Systems Co.
Hitachi Ltd.
Hoei Co.
Huawei Technologies

Yasuhisa Hayashi
Sophia Feng, Bowen Shi
Hiroyasu Miura
Anyun Liu
Takayuki Tsuzura
Yukiya Fukunaga
Tokimitsu Eso
Yuan Xu
Rumi Maeda
Tendo Hirai, Kumiko Teramae, Hidenobu Shiihara
Masaki Kirinaka, Akiko Tsukada
Takashi Kobayashi
Masaki Kunii
TF Chiang
Toshikazu Sekine
Masafumi Mitsuishi
Zhiping Yang
Akihiro Inoguchi, Shigenori Fujita, Hidetoshi Nakamura
David Banas
Passor Ho, Corey Huang, Hellen Lo, Edward Pan
Sadahiro Nonoyama
Yasuhiro Ikeda
Tatsuya Chiba
Haiping Cao, Longfang Lv, Shengli (Victory) Wang

| | |
|---|--|
| IB-Electronics | Hang (Paul) Yan, Chen (Jeff) Yu, Zhengyi Zhu |
| Independent | Peng Huang |
| Inspur Technologies | Matsumuro Makoto |
| | Hiroshi Ishikawa, Fumiyo Kawafuji |
| | Josh Chen, Steven Ho, Dane Huang, Nieves Lee |
| | Eric Lee, Rock Wang |
| Institute for Information Industry | Joseph Yang |
| Japan Radio Co. | Hiroto Katakura |
| JEITA | Yukio Masuko |
| John Baprawski, Inc. | John Baprawski |
| JVC Kenwood Corp. | Yasutoshi Ojima, Masayuki Kurihara |
| KEI Systems | Shinichi Maeda |
| Keihin Corp. | Takayuki Ota |
| Lapis Semiconductor Co. | Satoshi Tachi |
| Lattice Semiconductor | Dinh Tran, Maryam Shahbazi |
| Lenovo | Mark Zheng, Alex Chu, Alan Sun, Simon Yeh |
| Marvell | Jianping Kong, Fang Lv, Banglong Qian |
| | Songjie (Jacky) Wang, Liang Wu |
| Megachips Corp. | Tomochika Kitamura |
| Mitsubishi Electric Corp. | Yusuke Suzuki |
| Mobile Techno Corp. | Kazuhiro Kamegawa |
| Molex Japan | Nobumasa Motohashi |
| Murata Manufacturing Co. | Kazutaka Mukaiyama |
| Nanya Technology Corp. | Ching-Feng Chen, Chi-Wei Chen |
| | Taco (Changqun) Hsieh, Benson Hsu, George Lee |
| | Linda, Allen Ye |
| NEC Magnus Communications | Toshio Saito |
| New H3C Group | Xinyi Hu, Zixiao Yang |
| Nikon Corp. | Manabu Matsumoto |
| Nvidia Corp. | Norman Chang, Chiayuan Hsieh, Rich Lu |
| | Chihwei (Jason) Tsai |
| Oki Electric Industry Co. | Kenichi Saito |
| OmniVision | Sirius Tsang |
| Panasonic Corp. | Minori Harada, Tomohiro Tsuchiya, Naoyuki Aoki |
| | Atsushi Nakano |
| Panasonic Industrial Devices, Systems and Technology Co. | Kazuki Wakabayashi |
| Politecnico di Milano | Flavia Grassi, Xinglong Wu |
| Politecnico di Torino | Tommaso Bradde, Marco De Stefano, Paulo Manfredi |
| | Riccardo Trincherro, Stefano Grivet-Talocia |
| PWB Corp. | Toru Ohisa |
| Qualcomm | Kevin Roselle, Tim Michalka, Zhiguang Li |
| Razer | Irwin (Zhilong) Xue |
| Renesas Electronics Corp. | Masayasu Koumyou, Kazunori Yamada, Kenzo Tan |
| | Hiroyoshi Kuge, Masato Suzuki |

| | |
|---|--|
| Ricoh Company | Kazuki Murata, Yasuhiro Akita, Kazumasa Aoki Toshihiko Makino, Koji Kurose |
| RITA Electronics Ltd. | Kenichi Higashiura, Hiroyuki Motoki |
| Rohm Co. | Noboru Takizawa, Ryosuke Inagaki, Nobuya Sumiyoshi |
| Ryosan Co. | Takahiro Sato, Takumi Ito |
| SAE ITC | (Jose Godoy) |
| Sanwa Denki Kogyo Co. | Yutaka Takasaki |
| Shanghai IC R&D Center (ICRD) | Huijie Yan, Hailing Yang |
| Shanghai Zhaoxin Semiconductor | Chuanyu (Liam) Li |
| Shinewave | Nike Yang |
| Shinko Electric Industries Co. | Takumi Ikeda |
| Signal Metrics | Ron Olisar |
| Silvaco Japan Co. | Yoshihiko Yamamoto, Kaoru Kashimura |
| SMK Corp. | Norihide Taguchi |
| Socionext | Megumi Ono, Yumiko Sugaya, Mitsuhiro Tomita Katsuya Ogata, Yoshihiko Sumimoto, Yuji Nakagawa Takashi Araki |
| Sohwa & Sophia Technologies | Tomoki Yamada |
| Sony Global Manufacturing & Operations Corp. | Takashi Mine, Toshio Murayama, Taichi Hirano Takashi Mizoroki |
| Sony LSI Design | Toru Fujii |
| Sony Semiconductor Solutions | Takeshi Ogura |
| SPISim | Wei-hsing Huang, Wei-Kai Shih |
| Stanford University | Tom Lee |
| STMicroelectronics | Aurora Sanna, Olivier Bayet |
| Syswave | Kazuo Ogasawara |
| Tatung Technology | Barry Chen |
| TDK Corp. | Kotaro Suzuki |
| Technopro Design Co. | Mai Fukuoka |
| Teledyne LeCroy | Denny Li, Nan Son, Suping Wu, Sherry |
| Telepower | Kenji Kobayashi |
| TFF Tektronix Co. | Katsuhiko Suzuki |
| Thine Electronics | Takafumi Nakamori |
| Tomen Devices Corp. | Kinji Mitani |
| Toshiba Corp. | Yasuki Torigoshi |
| Toshiba Development & Engineering Corp. | Nobuyuki Kasai |
| Toshiba Electronic Devices & Storage Corp. | Atsushi Tomishima, Yasunobu Umemoto Yoshinori Fukuba, Hitoshi Imi, Motochika Okano Tetsuya Nakamura |
| Toshiba Memory Corp. | Masato Kanie, Takayuki Mizogami |
| Toshiba Memory Systems Co. | Eiji Kozuka, Tomomichi Takahashi |
| Toshiba Microelectronics Corp. | Jyunya Masumi |
| Unisoc | Junyong Deng, Nikki Xie |
| Université de Bretagne Occidentale | Mihai Telescu, Charles Canaff |

| | |
|----------------------------------|------------------|
| University of Illinois | José Schutt-Aine |
| University of Siegen | Elmar Griese |
| University of Technology Hamburg | Torben Wendt |
| Xpeedic | Suxiang Zhou |
| Xrossvate | Toshiyuki Kaneko |
| Yamaha Corp. | Tetsuya Kakimoto |
| Zhejiang Uniview Technologies | Fang Yang |
| Zheijiang YUSHI Technology | E. Deng |

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 |
|-------------------|----------------|------------------|
| December 21, 2018 | 624 227 121 | IBISfriday11 |

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

<http://tinyurl.com/y7yt7buz>

All teleconference meetings are 8:00 a.m. to 9:55 a.m. 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.

NOTE: "AR" = Action Required.

INTRODUCTIONS AND MEETING QUORUM

Randy Wolff declared that a quorum was reached.

CALL FOR PATENTS

Mike LaBonte called for declaration of any patents or pending patents related to the IBIS 3.2, IBIS 4.2, IBIS 5.1, IBIS 6.1, Touchstone 2.0, IBIS-ISS 1.0 or ICM 1.1 specifications. No patents were declared.

REVIEW OF MINUTES AND ARS

Mike LaBonte called for comments on the minutes of the November 2, 2018 IBIS Open Forum teleconference. Walter Katz moved to approve the minutes. Lance Wang seconded the motion. There were no objections.

Mike noted that the Asian IBIS Summit meeting minutes were released relatively shortly before

this meeting. Bob Ross suggested the minutes be reviewed in the next IBIS Open Forum teleconference meeting. Bob asked Ted Mido about the spelling of Japanese names where sometimes an “o” is followed by an “h”, as in “oh”. Ted noted that there is no set rule about these spellings, and it is up to individual preference.

ANNOUNCEMENTS, CALL FOR ADDITIONAL AGENDA ITEMS

Bob Ross noted that BIRD197 was sent out, but it is not on the agenda sent out. Mike LaBonte noted it is on his agenda for discussion.

Bob also noted that Ted Mido had interest in sharing his presentation from the Japan IBIS Summit during the meeting.

MEMBERSHIP STATUS AND TREASURER'S REPORT

Bob Ross reported that we have 25 members. There is \$26,147 in our account, with \$24,897 accumulated for 2018. \$1,250 is allocated to 2019 for DesignCon sponsorship. We are expecting several expenses from the Summits to be paid out soon.

Bob sent a membership renewal list to Phyllis Gross [at SAE] so she can send out 2019 renewal notices at her convenience.

WEBSITE ADMINISTRATION

Mike LaBonte reported that the Past Summits page has been updated to add in the Asian IBIS Summits. Mike found a problem with the script generating the presentation posting page. When a title of a presentation had a colon, the portion after the colon was missing. This is fixed now.

MAILING LIST ADMINISTRATION

Mike LaBonte reported that there has been no unusual activity. There have been a few drops and joins on the mailing list.

LIBRARY UPDATE

No update.

INTERNATIONAL/EXTERNAL ACTIVITIES

- Conferences

None.

- Press Update

None.

- Related standards

IEC 63055/IEEE 2401, JEITA “LPB”

Michael Mirmak reported that Draft 2 of LPB was made available today and is open for comments. December 18, 2018 is the next meeting of the LPB group. Mike LaBonte asked if Michael is able to discuss the document in more detail, given that only working group members have access. Michael will confirm what he is able to share more broadly [AR].

SUMMIT PLANNING AND STATUS

- Asian IBIS Summit (Tokyo)

An IBIS Summit was held at the Akihabara UDX building on November 12, 2018. Mike LaBonte noted the event was very well managed by JEITA. About 135 people representing 81 organizations attended. There were good presentations. He added that we have a good relationship with JEITA. Mike noted thanks to the sponsors including ANSYS, Apollo Giken Co., Cadence Design Systems, Cybernet Systems, Keysight Technologies, Ricoh, Toshiba Corporation, and Zuken.

- Asian IBIS Summit (Shanghai)

An IBIS Summit was held at the Parkyard Hotel Shanghai on November 14, 2018. About 58 people representing 25 organizations attended. Mike noted attendance might be lower due to the event taking place on a Wednesday instead of a Friday. Lance Wang noted attendees were talking in Shanghai and Taipei about attendance going down. There were suggestions to change the meeting format to bring in sessions for vendor specific talks. Vendors might bring more customers to the meeting to attend their technical portion. Mike noted this could be handled more like the sponsored vendor presentations at DesignCon. We should discuss amongst the IBIS board some ideas to increase attendance for next year. Mike noted thanks to Huawei Technologies, the primary sponsor, and IO Methodology, Mentor, a Siemens Business, Synopsys, Teledyne LeCroy, and ZTE Corporation, the additional sponsors.

- Asian IBIS Summit (Taipei)

An IBIS Summit was held at the Sherwood Hotel on November 16, 2018. About 47 people representing 17 organizations attended. Mike noted thanks to the sponsors Cadence Design Systems, KairosTech Innovation (SPISim), and Synopsys.

Mike reported that he discussed the BIRD process during each of the Summits. Some presentations each year discuss BIRD ideas, but these ideas rarely turn into BIRDS. He took time to show the process to the attendees.

- DesignCon 2019 IBIS Summit

DesignCon will be held in Santa Clara, CA on January 29 through January 31, 2019. An IBIS Summit will be held on Friday, February 1, 2019. Mike noted UBM is doing more cross promotions. SAE is doing a press release for DesignCon as well as some social media postings. We will likely have some promotional materials to send out to our mailing list. Keysight Technologies is a sponsor, with others to be determined.

Sponsorship opportunities for all upcoming IBIS summits are available, with sponsors receiving free mentions in the minutes, agenda, and other announcements. Contact the IBIS Board for further details.

QUALITY TASK GROUP

Mike LaBonte reported that the group is meeting on Tuesdays at 8:00 a.m. PT. The discussion has been mostly about the development of IBISCHK.

The Quality task group checklist and other documentation can be found at:

http://www.ibis.org/quality_wip/

ADVANCED TECHNOLOGY MODELING TASK GROUP

Arpad Muranyi reported that the group normally meets regularly on Tuesdays at 12:00 p.m. PT. They started to discuss the BIRD draft submitted for single ended IBIS-AMI simulations by Walter Katz. The meeting next Tuesday will be used by the Editorial task group.

Task group material can be found at:

http://www.ibis.org/macromodel_wip/

INTERCONNECT TASK GROUP

Michael Mirmak reported that the group usually meets at 8:00 a.m. PT on Wednesdays. The group remains suspended until IBIS 7.0 activities are completed.

Task group material can be found at:

http://www.ibis.org/interconnect_wip/

EDITORIAL TASK GROUP

Michael Mirmak reported that the group is meeting at 8:00 a.m. PT on Wednesdays and on Fridays when there is no Open Forum teleconference as well as during some ATM task group time slots. The group remains on schedule to finish the editorial work before the end of the year. No additional BIRDs are expected to be included at this time. Some editorial issues have technical implications and need further discussion. Watch the reflectors for a submittal of IBIS 7.0 before the December 21, 2018 IBIS Open Forum meeting.

Task group material can be found at:

http://www.ibis.org/editorial_wip/

NEW ADMINISTRATIVE ISSUES

None.

STUDY ON POTENTIAL FEATURE ADDITIONS FOR BIT-BY-BIT SIMULATION TECHNIQUE TO ADDRESS THE DDR5 REQUIREMENTS

Ted Mido gave an overview of his presentation given during the Tokyo IBIS Summit. He presented on collecting items probably needed for DDR5 simulations. Equalizers in DDR5 are used. Very low BER is taken into account in the future. Transient analysis is still useful, but long bit pattern simulations are also needed. The convolution technique is commonly used for IBIS-AMI simulation, with a bit stream convolved with the channel impulse response. Superposition is an alternative, using pulse patterns. This technique can capture rise/fall asymmetry from a driver. Transient analysis is the third technique, and the most accurate, but is very slow to simulate long bit patterns. Switchable simulation engines could allow customers to compare multiple simulation techniques.

He discussed capturing SSO in an eye diagram simulation. A two-step approach captures a non-SSO eye diagram. Then, the power supply is characterized and a power supply induced jitter (PSIJ) number is derived. He showed a target system used to analyze various simulation techniques. There are challenges with SSO noise characterization, where a PDN may have a very long time constant. SSO is input pattern dependent, with stronger timing variation than voltage variation. He looked at edge response superposition for the SSO probability density function. The response looked very Gaussian for a 1-million-bit superposition, but he is not sure how true this is for other systems.

He showed how to translate voltage noise to timing noise. The timing jitter probability was convolved with the eye diagram. There was good agreement between transient and edge response superposition. He noted the `clock_times` array, as an output of `AMI_GetWave`, could be modified to be an input for DDR5 models, with a new `Reserved_Parameter` to indicate the use model. This would allow the DQS signal to be used to clock the DQ IBIS-AMI model. He showed simulation results with correlated jitter on DQ and DQS. If the external clock is not used, the jitter is amplified, as it might not be in reality. He then showed the results with uncorrelated jitter on DQ and DQS. Not using the external clock may result in more pessimistic eye opening.

Bob Ross asked on slide 20, if there is a new array needed. Ted noted no change in the `AMI_GetWave` prototype, where the same `clock_times` variable is used. There is a new parameter needed, likely as a `Type Info`. Mike noted the proposal would mean the `clock_times` vector would not be passed in blank, as it is done now.

Walter Katz noted IBIS-AMI can describe jitter of the clock inside the DLL. He asked how the EDA tool would know the correct phase of the DQS for generating the `clock_times` vector. This is done through training in a real system. Ted noted StatEye can take the timing offset of the two eye diagrams into account. Walter noted if you have clock ticks as an input to Rx, then the Tx model should generate the clock ticks, needing some BIRD147 backchannel like training between the Tx and Rx. Walter noted he puts a CDR in the Rx model currently to emulate what the training does. Ted noted they use two channels for DQ and DQS, then assume a 90-degree phase shift of DQS to DQ.

Walter asked about the non-LTI labeling noted in the presentation for the channel description. Is this related to the asymmetric rise/fall time? Since it is likely that the TX buffer operates in a restricted voltage range, is a linear approximation ok? Ted noted some drivers are operated in the linear region and some are not. He does not assume the TX buffer is linear.

Arpad Muranyi asked if Ted researched asymmetric rising/falling edges. Ted noted in StatEye, a multi-edge model pattern can take more non-linearity into account. Arpad asked more about the IBIS-AMI flow. Ted confirmed he is not using IBIS-AMI for the Tx side. Using IBIS-AMI for the Rx is relatively straightforward. Ted noted there was another presentation in the Summit about doing some special convolution techniques using rise and fall impulse responses to account for rise/fall driver asymmetry.

Walter noted he will give a paper at the DesignCon Summit about his technique for working with rise/fall asymmetry. Bob asked Ted if he might give a presentation at the DesignCon IBIS Summit. Ted was not sure if he would be able to attend yet.

BIRD197: NEW AMI RESERVED PARAMETER DC_OFFSET

Walter Katz introduced the BIRD. He noted DDR5 is not what IBIS-AMI was originally designed for, with several differences including being single-ended signaling. This BIRD specifically addresses the problem of single-ended signaling. With the input to the AMI model being an impulse response, the common mode voltage is lost, and the AMI model may want to know that voltage level. The EDA tool can calculate this value as the average of the high and low voltage levels of the step response, and this value can then be passed into the model. The value in the model's .ami file can be a placeholder, and this value can be replaced by the EDA tool to be passed into the DLL.

Bob Ross noted some editorial comments needing to be addressed for a BIRD197.1 revision. Mike LaBonte asked about the use of DC_Offset by the AMI_GetWave function. Walter noted that the model can use the value to shift the waveform internally. The output of AMI_GetWave should still be a differential output. The input to the RX model is still a differential waveform as well. Walter noted comments are welcome for incorporation into a BIRD197.1.

BIRD166.4: RESOLVING PROBLEMS WITH REDRIVER INIT FLOW

Discussion was tabled.

BIRD181.1: I-V TABLE CLARIFICATIONS

Discussion was tabled.

BIRD190: CLARIFICATION FOR REDRIVER FLOW

Discussion was tabled.

IBISCHK PARSER AND BUG STATUS

Bob Ross reported there are no new bugs for IBISCHK6.1.5. We are waiting for the official parser release. He expected this sooner, but he has not received it from the developer. Bugs 190-201 are covered, and this provides a new baseline for the IBISCHK7.0 parser. Bob expects the release sometime in the next two weeks.

NEW TECHNICAL ISSUES

None.

NEXT MEETING

The next IBIS Open Forum teleconference meeting will be held on December 21, 2018. The following IBIS Open Forum teleconference meeting is tentatively scheduled on January 11, 2019.

Arpad Muranyi moved to adjourn. Bob Ross seconded the motion. The meeting adjourned.

NOTES

IBIS CHAIR: Mike LaBonte

mlabonte@sisoft.com

IBIS-AMI Modeling Specialist, SiSoft
6 Clock Tower Place, Suite 250
Maynard, MA 01754

VICE CHAIR: Lance Wang (978) 633-3388

lwang@iometh.com

President/CEO, IO Methodology, Inc.
PO Box 2099
Acton, MA 01720

SECRETARY: Randy Wolff (208) 363-1764

rrwolff@micron.com

Principal Engineer, Silicon SI Group Lead, Micron Technology, Inc.
8000 S. Federal Way
P.O. Box 6, Mail Stop: 01-711
Boise, ID 83707-0006

TREASURER: Bob Ross (503) 246-8048

bob@teraspeedlabs.com

Engineer, Teraspeed Labs
10238 SW Lancaster Road
Portland, OR 97219

LIBRARIAN: Anders Ekholm (46) 10 714 27 58, Fax: (46) 8 757 23 40

ibis-librarian@ibis.org

Digital Modules Design, PDU Base Stations, Ericsson AB
BU Network
Färögatan 6
164 80 Stockholm, Sweden

WEBMASTER: Mike LaBonte

mlabonte@sisoft.com

IBIS-AMI Modeling Specialist, SiSoft
6 Clock Tower Place, Suite 250
Maynard, MA 01754

POSTMASTER: Curtis Clark

curtis.clark@ansys.com

ANSYS, Inc.
150 Baker Ave Ext
Concord, MA 01742

This meeting was conducted in accordance with ANSI guidance.

All inquiries may be sent to info@ibis.org. Examples of inquiries are:

- To obtain general information about IBIS.
- To ask specific questions for individual response.
- To subscribe to the official ibis@freelists.org and/or ibis-users@freelists.org email lists (formerly ibis@eda.org and ibis-users@eda.org).
- To subscribe to one of the task group email lists: ibis-macro@freelists.org, ibis-interconn@freelists.org, or ibis-quality@freelists.org.
- To inquire about joining the IBIS Open Forum as a voting Member.
- To purchase a license for the IBIS parser source code.
- To report bugs or request enhancements to the free software tools: ibischk6, tschk2, icmchk1, s2ibis, s2ibis2 and s2iplt.

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

<http://www.ibis.org/bugs/ibischk/>
<http://www.ibis.org/bugs/ibischk/bugform.txt>

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

<http://www.ibis.org/bugs/tschk/>
<http://www.ibis.org/bugs/tschk/bugform.txt>

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

<http://www.ibis.org/bugs/icmchk/>
http://www.ibis.org/bugs/icmchk/icm_bugform.txt

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

<http://www.ibis.org/bugs/s2ibis/bugs2i.txt>
<http://www.ibis.org/bugs/s2ibis2/bugs2i2.txt>
<http://www.ibis.org/bugs/s2iplt/bugspl.txt>

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

<http://www.ibis.org/>

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

<http://www.ibis.org/directory.html>

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SAE STANDARDS BALLOT VOTING STATUS

| Organization | Interest Category | Standards Ballot Voting Status | November | November | November | November |
|-------------------------------|-------------------|--------------------------------|----------|----------|----------|----------|
| | | | 12, 2018 | 14, 2018 | 16, 2018 | 30, 2018 |
| ANSYS | User | Inactive | X | - | - | - |
| Applied Simulation Technology | User | Inactive | - | - | - | - |
| Broadcom Ltd. | Producer | Inactive | - | - | - | - |
| Cadence Design Systems | User | Active | X | X | X | X |
| Cisco Systems | User | Inactive | - | - | - | - |
| CST | User | Inactive | - | - | - | - |
| Ericsson | Producer | Active | X | X | X | - |
| GLOBALFOUNDRIES | Producer | Inactive | - | - | - | X |
| Huawei Technologies | Producer | Inactive | - | - | - | - |
| IBM | Producer | Inactive | - | - | - | - |
| Infineon Technologies AG | Producer | Inactive | - | - | - | - |
| Intel Corp. | Producer | Active | - | X | X | X |
| IO Methodology | User | Inactive | - | X | - | X |
| Keysight Technologies | User | Inactive | X | - | - | X |
| Maxim Integrated | Producer | Inactive | - | - | - | - |
| Mentor, A Siemens Business | User | Active | X | X | - | X |
| Micron Technology | Producer | Inactive | X | - | - | X |
| NXP | Producer | Inactive | - | - | - | - |
| Raytheon | User | Inactive | - | - | - | - |
| SiSoft | User | Active | X | X | X | X |
| Synopsys | User | Active | X | X | - | X |
| Teraspeed Labs | General Interest | Inactive | - | - | - | X |
| Xilinx | Producer | Inactive | - | - | - | - |
| ZTE Corp. | User | Inactive | - | X | - | - |
| Zuken | User | Inactive | X | - | - | - |

Criteria for SAE 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 SAE standards 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.