

**IBIS Open Forum Minutes**

Meeting Date: **November 14, 2016**

Meeting Location: **Taipei, Taiwan**

**VOTING MEMBERS AND 2016 PARTICIPANTS**

ANSYS Curtis Clark, Toru Watanabe

Broadcom (Avago Technologies) Bob Miller

Cadence Design Systems Ken Willis, Brad Brim, Aileen Chen, Lanbing Chen

 Zhiyu Guo, Mohan Jiang, Rachel Li, Ping Liu

 Haisan Wang, Yitong Wen, Clark Wu, Dingru Xiao

 Benny Yan, Haidong Zhang, Wenjian Zhang

 Zhangmin Zhong, Hui Wang, Jinsong Hu, Wei Dai

 Rong Zhang, Kent Ho\*, Skipper Liang\*, Jack Lin\*

 Candy Yu\*

Cisco Systems Giuseppi Selli, Brian Baek, Hannah Bian, Tonghao Ding

 Amanda Liao, Cassie Yan

CST Stefan Paret

Ericsson Anders Ekholm\*, David Zhang, Zilwan Mahmod

 Guohua Wang

GLOBALFOUNDRIES Steve Parker

Huawei Technologies Yuanbin Cai, Haiping Cao, Zhenxing Hu, Peng Huang

 Xusheng Liu, Longfang Lv, Guanjiang Wang

 Chen Yu, Cheng Zhang, Gezi Zhang, Zhengyi Zhu

 Fangxu Yang, Huajun Chen, Xiao Peng

 Zhengrong Xu, Xianbiao Wang, Lin Shi

 Hongcheng Yin

IBM Adge Hawes, Luis Armenta, Trevor Timpane

Infineon Technologies AG (Christian Sporrer)

Intel Corporation Hsinho Wu, Mohammad Bapi, Michael Mirmak,

 Masahi Shimanouchi, Todd Bermensolo, Zao Liu,

 Gong Ouyang, Udy Shrivastava, Gianni Signorini,

 Richard Mellitz, Youqing Chen, Jennifer Liu

 Luping Liu, Bruce Qin, Yuyang Wang, Denis Chen\*

 Jimmy Hsu\*, Thonas Su\*, Morgan Tseng\*

IO Methodology Lance Wang\*

Keysight Technologies Radek Biernacki, Heidi Barnes, Jian Yang, Fangyi Rao, Stephen Slater, Pegah Alavi, Edwin Young

Maxim Integrated Yan Liang, Don Greer, Thinh Nguyen, Joe Engert,

 Hock Seon, Ahmed Gendy

Mentor Graphics Arpad Muranyi, Vladimir Dmitriev-Zdorov, John Angulo,

 Mikael Stahlberg

Micron Technology Randy Wolff, Justin Butterfield

Signal Integrity Software Mike LaBonte\*, Walter Katz, Todd Westerhoff,

 Richard Allred

Synopsys Ted Mido, Kevin Li, Massimo Prando, Xuefeng Chen

 Andy Tai, Jinghua Huang

Teraspeed Labs Bob Ross

Xilinx (Raymond Anderson)

ZTE Corporation Shunlin Zhu, Fengling Gao, Lili Wei, Zhongmin Wei

 Bi Yi, Changgang Yin, Yang Yang, Xiaoli Yu

Zuken Michael Schaeder, Amir Wallrabenstein

**OTHER PARTICIPANTS IN 2016**

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Alcatel-Lucent Yishan Li, Yiqing Mao

ASUSTek Computer Nick Huang\*

Aurora System Dian Yang

Avant Technology Jyam Huang\*, Chloe Yang\*

BasiCAE Software Technology Darcy Liu

Celestica Allen Wang, Vincent Wen

eASIC David Banas

Edadoc Deheng Chen, Hong Zhang

FiberHome Technologies Yejing Jia

Foxconn Electronics Gino Chen\*, Ryan Hou\*, Mandy HY Su\*

Fujitsu Advanced Technologies Shogo Fujimori

Ghent University Paolo Manfredi

Gigabyte Technology Chris Tsai\*, CJ Wang\*

Gowin Semiconductor Xiaozhi Lin, Qi Zhou

H3C Bin Chen, Mao Jun, Xing Hu

Hamburg University of Technology Jan Preibisch, David Dahl

Hanghou Hikvision Digital Wenquan Hu

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Independent Carl Gabrielson

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 Appliquées et de Technologie de

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John Baprawski, Inc. John Baprawski

KEI Systems Shinichi Maeda

Lattice Semiconductor Dinh Tran, Maryam Shahbazi

Leading Edge Pietro Vergine

Lenovo John Lin\*, Alan Sun\*

Lite-On Technology Steven Chen\*, Steven CH Chen\*, Sam Lyu\*

Marvell Jie Pan, Weizhe Li, Liang Wu, BL Qian, Fang Lv

MathWorks Mike Mulligan, Corey Mathis

Monsoon Solutions Nathan Hirsch

Mostec Ninghua Li, Kaihe Zhang

Nanya Technology Corp. Chiwei Chen\*, Andy Chih\*, Taco Hsieh\*, Jordan Hsu\*

 Andre Huang\*, Raphael Huang\*, George Lee\*, Allen Zuo\*

Northrup Grumman Alex Golian

Novatek Vincent Lin\*, Willy Lin\*

Nvidia Corp. Norman Chang\*, David Chen\*, Chihwei Tsai\*, Ann Yen\*

NXP Jon Burnett

Peace Giant Corp. Walter Huang\*, Jimmy Liu\*

Pegatron Corp. Aje Chang\*, Stanley Chu\*

Politecnico di Torino Claudio Siviero, Stefano Grivet-Talocia,

 Igor Simone Stievano

Qualcomm Technologies Guobing Han, Irwin Xue\*

Quanta Computer Eriksson Chuang\*, Scott CH Lee\*

Rambus John Yan

Raytheon Joseph Aday

SAE International (Logen Johnson)

SAIC Motor Corp Weng Yang

Shanghai Zhaoxin Semiconductor Jude Ji

Shenzhen Zhongzeling Electronics Nick Huang

SILABTECH Biman Chattopadhyary

Silicon Motion Technology Matt Lin\*

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SiGuys Donald Telian

SMICS Sheral Qi

Sony Corporation Hiroaki Ammo

Sony LSI Design Takashi Hasegawa

SPISim Wei-hsing Huang\*

Spreadtrum Communications Junyong Deng, Steven Guo, Baoping Bian

 Yanbiao Chu, Nikki Xie, Zhi Wang

STMicroelectronics Fabio Brina, Olivier Bayet

Technoprobe Alberto Berizzi, Lorenzo Bernasconi, Simona Cucchi

Teledyne LeCroy Denny Li, Yifeng Wu

Université de Bretagne Occidentale Mihai Telescu

Vendorchain Jun Zhao, Jing Luo, Dong Lei

VIA Labs Sheng-yuan Lee\*

VIA Technologies Terence Hsieh\*, Jerry Hsu\*, Justin Hsu\*

Winbond Electronics Albert Li\*

Xpeedic Technology Max Cang\*, Mingcan Zhao, Zhouxiang Su, Rui Wang

 Qionhui Gui, Wenliang Dai, Yuqing Shen

 Haitao Zhang, Rick Chang\*, Zachary Su\*

Zhejiang Uniview Technologies Weiqi Chen, Jiayun Dai

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

November 18, 2016 Asian IBIS Summit Tokyo – no teleconference

December 2, 2016 628 078 024 IBISfriday11

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

 <https://sae.webex.com/sae/j.php?MTID=m0a07ee0ddc25e28af96b4bbad3c17f4b>

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.

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**OFFICIAL OPENING**

The Asian IBIS Summit took place on Monday, November 14, 2016 at the Sherwood Hotel in Taipei. About 59 people representing 26 organizations attended.

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

<http://www.ibis.org/summits/nov16b/>

Mike LaBonte welcomed participants on behalf of the IBIS Open Forum and convened the meeting, noting that only technical presentations would be on the agenda, and there would be no voting.

Mike continued by thanking all the co-sponsors including Cadence Design Systems, IO Methodology, Peace Giant Corporation, Synopsys and Xpeedic Technology.

**IBIS CHAIR’S REPORT**

Mike LaBonte (Signal Integrity Software (SiSoft), USA)

Mike LaBonte presented updates on work in progress in the ATM, Interconnect and Quality task groups. This includes an IBIS 6.2 release, backchannel support, C\_comp model enhancements, redriver flow enhancements, and an interconnect modeling BIRD. Several BIRDs have been approved for IBIS 6.2 while some are still in progress. The IBIS Open Forum has 22 members and regular teleconference and Summit meetings. The China regional forum is a new group affiliated with IBIS.

**CASE STUDY: MODELING IBIS FOR OPEN\_DRAIN TRUE DIFFERENTIAL PAIR BUFFER**

Lance Wang\*, Yan Liang\*\* (\*IO Methodology and \*\*Maxim Integrated, USA)

Lance Wang presented. An Open\_drain differential pair presents a special case for IBIS modeling. The Open\_drain model type does not use Pullup I-V data, but this data is useful for modeling this type of buffer. Using an Output or I/O model type to model this type of buffer allows inclusion of Pullup I-V data and is a better solution. Improvements to the C\_comp model to capture voltage and frequency dependencies would improve the model further.

**DIFFERENTIAL MODELING FLOW WITH SERIES MODEL IN VERILOG-A**

Wei-hsing Huang\* and Sanjeev Gupta\*\* (\*SPISim, USA and \*\*Sigintegrity Solutions, India)

Wei-hsing Huang presented. Half/true differential buffers are modeled including a series model for the effects of differential current and differential capacitance. The rigid syntax of the series model can lead to many inaccuracies. Replacing the series model with a Verilog-A model using [External Model] syntax streamlines the modeling flow, improves V-T extraction accuracies, and removes the rigid series model syntax. A modeling flow for creating the Verilog-A model was presented.

**IBIS-AMI MODEL GENERATION WITH QUALITY**

Skipper Liang (Cadence Design Systems, ROC)

Skipper Liang presented starting with an overview of channel simulation equations and IBIS-AMI models. IBIS-AMI model generation flow involves many steps, and validation is the key. Validation includes comparisons to Spice transistor-level model simulations. An example was shown of USB 3.0 RX and TX IBIS-AMI models in simulation including real channel characteristics.

A comment was made that the IBIS-AMI model validation should check the modified impulse/step response, not waveforms and eye diagrams.

**ACHIEVING FULL SYSTEM SIGNAL INTEGRITY FOR HIGH SPEED BACKPLANE SYSTEM**

Wenliang Dai (Xpeedic Technology, PRC)

Zachary Su presented. The presentation included an introduction of backplane systems, challenges to backplane system simulation, components of EM simulation, an analysis workflow, and details of full backplane system SI simulation. Zachary concluded that passive channel modeling and simulation is essential to high speed channel design. Optimal channel design requires user friendly EDA tools to do layout extraction, via optimization, trace simulation, S-parameter cascading and S-parameter exploration. Full backplane system SI simulation is achieved by sweeping all the channels with correct models.

**ON-DIE DECOUPLING MODEL IMPROVEMENTS FOR IBIS POWER AWARE MODELS**

Randy Wolff# and Aniello Viscardi## (Micron Technology, #USA, ##Italy)

Lance Wang presented. He noted that on-die decoupling models for power aware modeling must be added external to the IBIS model currently. To correlate an IBIS model simulation with a transistor model simulation, the decoupling model may need multiple terminals. A Spice model may include a pre-driver on a separate power supply from the driver, and coupling may exist between the pre-driver supply and the final driver supply. The pre-driver and final driver may also share a common ground. One method for creating a non-proprietary decoupling model involves creating an S-parameter model. The S-parameter model could have multiple port options and may require a node 0 reference. Lance showed results of two simulations including package models with either an ideal or non-ideal connection to the pre-driver supply of the Spice model. A 2-port decoupling model was necessary for good correlation in the case with the ideal connection to the pre-driver supply. A 3-port decoupling model was necessary for good correlation in the case with the non-ideal connection to the pre-driver supply. Lance concluded that a multi-port decoupling model is most versatile. Unused ports not connected to a package model should be connected to node 0, which is also the reference port for the S-parameter model.

A question was asked if the decoupling network should be captured in the I-T and ISSO data in the model. Lance answered that the decoupling network is around the power supply and/or between the pre-driver and driver. It is not captured in I-T and ISSO curves.

**IBISCHK6 V6.1.3 AND EXECUTABLE MODEL FILE CHECKING**

Bob Ross (Teraspeed Labs, USA)

Mike LaBonte presented. New ibischk6 version 6.1.3 executables are available that BUGs 174-180. The executable names include 32 and 64-bit operating system designations. An enhancement is executable model file checking per BUG179 for [Algorithmic Model] executable lines. Executable files are checked for the existence of required functions based on .ami file Reserved\_Parameters settings.

**TOUCHSTONE CONVERSION WRAPPER**

Anders Ekholm (Ericsson, Sweden)

Anders Ekholm presented. The tschk2 Touchstone file parser can be used to convert Touchstone models to Touchstone 2 models using the –canonical option. Using this option strips out any comments from the original Touchstone file which may contain useful port information. Anders wrote a Perl script that solves this issue. The script is available on the IBIS Open Forum website.

A question was asked about the difference between Touchstone 1 and Touchstone 2. Anders answered that Touchstone 2 contains more enhancements. For example, it can use different reference impedances for each port.

**DISCUSSION**

Mike LaBonte surveyed the attendees and established that most attendees were IBIS users. One attendee suggested that it would be helpful to have a workshop on how to find problems in IBIS models and fix them where possible. Mike mentioned that sometimes the simplest of problems such as having a wrong [File Name] could make a model fail, yet that is very easy to fix. A few other simple IBIS fixes were mentioned. One attendee noted that if a V-T table does not match the I-V tables, the user has no recourse.

**CLOSING REMARKS**

Mike LaBonte thanked the co-sponsors, presenters and attendees for their participation and support. The meeting adjourned at 4:30 PM.

**NEXT MEETING**

The next IBIS Open Forum teleconference meeting will be held December 2, 2016. The Asian IBIS Summit in Tokyo will be held November 18, 2016. No teleconferences will be available for the Summit meeting.

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**NOTES**

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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](http://www.ibis.org/%20bugs/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/bugsplt.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** | **October 14, 2016** | **November 4, 2016** | **November 11, 2016** | **November 14, 2016** |
| ANSYS | User | Inactive | X | X | - | - |
| Broadcom Ltd. | Producer | Inactive | X | - | - | - |
| Cadence Design Systems | User | Active | X | X | X | X |
| Cisco Systems | User | Inactive | - | - | X | - |
| CST | User | Inactive | - | - | - | - |
| Ericsson | Producer | Active | - | - | X | X |
| GLOBALFOUNDRIES | Producer | Inactive | X | X | - | - |
| Huawei Technologies | Producer | Inactive | - | - | X | - |
| Infineon Technologies AG | Producer | Inactive | - | - | - | - |
| IBM | Producer | Inactive | X | X | - | - |
| Intel Corp. | Producer | Active | X | X | X | X |
| IO Methodology | User | Active | X | X | X | X |
| Keysight Technologies | User | Inactive | X | X | - | - |
| Maxim Integrated | Producer | Inactive | - | - | - | - |
| Mentor Graphics | User | Inactive | X | X | - | - |
| Micron Technology | Producer | Inactive | X | X | - | - |
| Signal Integrity Software  | User | Active | X | X | X | X |
| Synopsys | User | Active | X | X | X | - |
| Teraspeed Labs | General Interest | Inactive | X | X | - | - |
| Xilinx | Producer | Inactive | - | - | - | - |
| ZTE | User | Inactive | - | - | X | - |
| Zuken | User | Inactive | - | - | - | - |

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.