IBIS Open Forum Minutes

Meeting Date: **March 10, 2023**
Meeting Location: **Teleconference**

VOTING MEMBERS AND 2023 PARTICIPANTS

Altair	(JuneSang Lee)
AMD (Xilinx)	(Bassam Mansour)
Analog Devices (Maxim Integrated)	(Tushar Pandey)
Ansys	Curtis Clark*, Wei-hsing Huang
Applied Simulation Technology	(Fred Balistreri)
Aurora System	Dian Yang, Raj Raghuram
Broadcom	(Yunong Gan)
Cadence Design Systems	Kyle Lake*, Jared James, John Philips, Kristoffer Skytte
Celestica	(Sophia Feng)
Cisco Systems	(Stephen Scearce), Hong Wu
Dassault Systemes	Stefan Paret
GE Healthcare Technologies	Balaji Sankarshanan
Google	(Hanfeng Wang)
Huawei Technologies	(Hang (Paul) Yan)
Infineon Technologies AG	(Christian Sporrer)
Instituto de Telecomunicações	(Abdelgader Abdalla)
Intel Corporation	Chi-te Chen, Hsinho Wu, Michael Mirmak*, Kinger Cai*
Keysight Technologies	Ming Yan, Douglas Burns, Fangyi Rao, Pegah Alavi, Hee-Soo Lee, Heidi Barnes
Marvell	Steven Parker*
MathWorks	Graham Kus*, Walter Katz*, Kerry Schotz
Micron Technology	Randy Wolff*, Justin Butterfield, Akshay Shivaji Chaudhari,Dragos Dimitriu
MST EMC Lab	(Chulsoon Hwang)
SerDesDesign.com	John Baprawski
Siemens EDA	Arpad Muranyi*, Weston Beal*, Matthew Leslie, Todd Westerhoff, Scott Wedge, Mikael Stahlberg
STMicroelectronics	(Olivier Bayet)
Synopsys	Ted Mido*
Teraspeed Labs	Bob Ross*
Waymo	Zhiping Yang*
ZTE Corporation	(Shunlin Zhu)
Zuken	Michael Schäder
Zuken USA	Lance Wang*

OTHER PARTICIPANTS IN 2023

Alphawave Semi	Adrien Auge, Todd Bermensolo
Ciena	Hugues Tournier
Honeywell	Bavish Vazhayil
Nokia	Ramiro Guzman
OMNIVISION	Sirius Tsang
Signal Edge Solutions	Ben Dannan
SI Guys	Donald Telian
Socionext, Inc.	Raymond Yakura
Unaffiliated	Will Hobbs, Mike LaBonte, Jon Powell, Stephen Peters

In the list above, attendees present at the meeting are indicated by "*." Those submitting an email ballot for their member organization for a scheduled vote 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 connection information for future IBIS teleconferences is as follows:

Microsoft Teams meeting
Join on your computer or mobile app
Click here to join the meeting

Join with a video conferencing device
106010980@teams.bjn.vc
Video Conference ID: 114 666 897 5
Alternate VTC dialing instructions

Or call in (audio only)
+1 267-768-8015,554664847#   United States, Philadelphia
Phone Conference ID: 554 664 847#
Find a local number | Reset PIN
Learn More | Meeting options

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
Graham Kus declared that a quorum had not been reached with 7 member-companies attending at the start of the meeting.

CALL FOR PATENTS

Randy Wolff called for declaration of any patents or pending patents related to the IBIS, IBIS-ISS, ICM, or Touchstone 2.0 specifications. Patents were not declared.

REVIEW OF MINUTES AND ARS

Randy Wolff called for comments on the minutes of the February 3, 2023 for the IBIS Summit. Curtis Clark motioned to approve. Lance Wang seconded. There were no objections, and the motion carried. Randy then discussed that the edited version of the minutes for February 17, 2023 had not yet been received. Graham Kus confirmed that the edits had been completed and due to an IT issue that mailbox user could not send attachments. The minutes would be present from a different account and later distributed to the reflector by the Chair in the meantime.

The Minutes are available at the following link:
https://IBIS.org/minutes/

Randy reviewed ARs from the previous meeting as follows:

- Steve Parker to complete post-DesignCon IBIS Summit website update tasks [AR]
- Status: Completed.

- Randy Wolff to provide link to SIJ and SAE ITC articles covering IBIS 30 year celebration and IBIS 7.2 release [AR]
- Status: These are submitted, but with regards to the IBIS 7.2 article- we have not received notification that it has been published yet.

- Steve Parker to update event page with details of IEEE SPI IBIS Summit meeting [AR]
- Status: completed.

- Bob Ross to start IBISCHK 7.2.0 parser contract signing process [AR]
- Status: pending.

ANNOUNCEMENTS, **CALL FOR ADDITIONAL AGENDA ITEMS**

Randy Wolff asked for any announcements- there were no new announcements.

MEMBERSHIP STATUS AND TREASURER'S REPORT

Bob Ross reported that for 2022, we closed with 29 members.

For 2023, we have 30 members and a quorum of 8.
GE Healthcare Technologies is a new member, joining in late February 2023.

Membership renewals are slowly trickling in. Currently we have 17 renewals and 2 new members for 2023. For an accumulation of 19 thus far out of expected count of 30.

We documented a $6,000 assessment by SAE ITC for 2022 services and recorded it on December 31, 2022. So we have closed the accounting for 2022 and will not track it any more after this report.

We paid the DesignCon 2023 dinner and catering charges. Totaling $3,315.

$20,561 Balance for the close of FY 2022 **(with $6,000 SAE ITC assessment)**
$19,311 Adjusted Balance for 2022

$11,585 Balance for 2023
$16,635 Adjusted Balance for 2023 (Note, 2020 ZTE sponsorship moved forward to 2023)

Bob reported there is an announcement that may affect membership. Zhiping Yang announced he is leaving Waymo as of May 3, 2023. Another individual will be taking up the attendance to represent Waymo in future meetings.

WEBSITE ADMINISTRATION

Steven Parker reported the two summit updates are made. The GE Healthcare logo is now added. There were also minor updates, IBIS 7.2 known issues document is updated. A few other documents from the Interconnect Task Group by Michael Mirmak were posted as well. In addition, an update to BIRD223 was posted.

MAILING LIST

Curtis Clark reported a member of one company had obsolete email that has now been updated. He confirmed that the minutes from February 17th are not appearing on the reflector.

LIBRARY UPDATE

Zhiping Yang reported there were no updates.

INTERNATIONAL/EXTERNAL ACTIVITIES

Conferences:

SPI2023 – The 27th IEEE Workshop on Signal and Power Integrity (May 07-10, 2023, Aveiro, Portugal).

Link to IEEE SPI 2023, 27th Workshop on Signal and Power Integrity:
https://spi2023.av.it.pt/

IEEE EMC+SIPI conference scheduled for July 31 – August 4, 2023 in Grand Rapids, Michigan.

Link:

https://emc2023.org/

Press Updates

Randy Wolff reported that SAE ITC would most likely post a "30 years of IBIS" note on their website. As the link is not yet available, Randy took an action to provide the link when available [AR].

Randy also reported there was an article in the Signal Integrity Journal about "30 years of IBIS." Link:
https://www.signalintegrityjournal.com/articles/3011-ibis-celebrates-30-years-of-collaboration-innovation-and-signal-integrity

Related Standards

Michael Mirmak reported that there were no updates regarding DASC.

IEEE IBIS Standardization

Randy Wolff reported that the IBIS Open Forum could attempt to pursue dual standardization but could be an intricate and tedious process.

Randy continued to report, we are in discussion with Michael McNair on a separate topic, he had been introduced to the IEEE ISTO, which is IEEE equivalent of SAE ITC (e.g. another trade consortia). In summary, this IEEE group provides management and legal services and professional services for standards groups. For example, the MIPI Alliance (relating to Automotive Ethernet) is another group operating with their services and support. Randy continued to relate that if the IBIS Open Forum needed to identify the specific portion of IEEE with which to standardize and associate, this may be a good fit as an option in the future.

Bob Ross stated that when it comes to the topic of dual standardization, the IEEE prefers joint committees, where if there are joint standards, they should be formed with a joint committee. There were discussions that the SPIM proposal might also be an IEEE proposal. He stated his take-away was if there is not an IEEE committee already working with IBIS Open Forum as a joint-committee, then it would not become an IEEE standard.

Randy replied in agreement that the effort may be made more difficult if not starting with joint work from the beginning.

Bob stated that in any parent organization they would provide the legal framework so to support our ability to operate as a legal entity. The issue is that with legal and invoicing, we would have to qualify our members as to the payment and invoicing procedures. For example, SAE ITC changed their bank account numbers and this resulted in complete re-qualifying with members. We would likely have to go through that with any organization, but it could be handled.

Bob suggested that we follow up with the Chair to get his input. Randy re-iterated SAE ITC dues are $6k per year and if by comparison the dues for IEEE ISTO are similar it could be a good fit.

Randy Wolff took an AR to locate an example of IEEE an SAE dual logo [AR].

IBIS Summits:

IEEE SPI 2023 IBIS Summit (May 7-10, 2023, Aveiro, Portugal):

Link:

https://spi2023.av.it.pt/submissions/

Link to IBIS Summit information:

https://spi2023.av.it.pt/ibis-summit/

Randy Wolff reported this would be the IBIS summit the afternoon Wednesday May 10th from 2pm to 6pm local time. The SPI runs until 12:30pm and followed by a lunch. IEEE SPI has already advertised the details on the website.

Randy reported that the final paper submissions deadline had been moved by IEEE to a new date of April 5, 2023. Also, that the IBIS Summit is scheduled to be held with hybrid-attendance on May 10th and would be the 25th IBIS Summit associated with events in Europe. He re-iterated that IBIS would allow hybrid attendance, although the IEEE SPI 2023 Workshop itself would require be in person attendance. Randy stated that he planned to attend the IEEE SPI Workshop and IBIS Summit in person, and that other members of the IBIS Open Forum may also attend.

QUALITY TASK GROUP

Bob Ross reported we pushed aside one of the activities regarding a quality document update. There is interest but we just do not have the preparation time available. We plan to discuss it later. BUG227 related to BIRD219.1, that's the root name check bug, which is required, and is now explicitly stated as required in IBIS. The Parser Developer stated there were some issues instantiations a test, where we would create Parser instability, or it would run forever in a race condition.

Note: 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 some of the updates would include multi-level keywords for modulation. Other would be items to be continued as per those minutes.

Note: Task group material can be found at:

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

INTERCONNECT TASK GROUP

Michael Mirmak had not yet joined so there was no update reported.

Note: Task group material can be found at:

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

EDITORIAL TASK GROUP

Randy Wolff reported this Task Group is on hold.

Note: Task group material can be found at:

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

NEW ADMINISTRATIVE ISSUES

Roll call: Graham Kus reported a mid-meeting count of 12 attendees.

NEW AND REVISED *IRDS

None.

IRDS SCHEDULED FOR VOTE

None.

IRDS ELIGIBLE FOR VOTE

None.

TABLED IRDS: (NO DISCUSSION WITHOUT MOTION TO "UNTABLE")

Randy Wolff reported there were some discussions about PSIJ BIRD topic, not-yet submitted by Kinger Cai. We confirmed there were not overlaps between the two. The question is whether we should move forward with BIRD220 now, or if we should wait for BIRD223. Arpad Muranti suggested we wait until Kinger's BIRD is also submitted so that people only attending the top-level IBIS Open Forum meeting sand minutes would have a chance to observe both at the same time for review at the same time. Randy agreed. There was no motion to un-table this BIRD220.

Link:

https://ibis.org/birds/bird220.docx

IBISCHK AND TSCHK PARSER AND BUG STATUS

Randy stated there were 3 bugs to discuss.

For BUG240, Bob stated this was submitted by Arpad is a parser crash. Bob wants to classify this and at some point we need to fix it. What happens is when your Interconnect Model does not have a name, then a window that looks like this in Text format, then it would be Microsoft C++ runtime window pops up, then the Parser stops, which is a parser crash. We need an error code for this condition. The example that produced this on the Interconnect Model group line, has its name commented out. This produces a Parser crash. Bob classified this bug as Severe/High and is currently open.   It is both a Parser crash with no error message and a specification violation. Arpad clarified that if there were other errors, then the Parser would not report these. Arpad stated this could be mistaken as a successful completion but is actually a crash with no error messages.

Bob moved to classify the bug as Severe/High. Arpad stated we have EMD model keywords-also- it would be useful to check all these named Keywords to confirm they do not show the same problem. Randy stated we can discuss this more in quality task group.

Bob stated BUG239 was by Michael Mirmak and is as follows: if an Interconnect Model is not referenced by a caution message, then digging into version 7.1 of IBIS and 7.2 of IBIS, and the precise language, and what he modified from Michael was his proposal was just for in-line Interconnect Model Set within an IBIS file. If we are going to do this, then it has be for all

Interconnect Model Set referenced by the IBIS file whether in-line or other .ims files that are external. Can't just be in-line, it would be an incomplete test. The problem is IBIS 7.1 stated that it is illegal to have floating Interconnect Model Set not referenced by the Interconnect Model group. It could be managed by locating all the Interconnect Models, and see if there are any extra files or in-line statements in the IBIS file.

Bob proposed classifying this as an enhancement. This would be a comprehensive test, and worth doing, but would go through all the files and model sets to confirm all linkages are valid and none are floating- in other words there is always a .ims file for its corresponding linkage in an IBIS file. Arpad asked for clarification. Bob responded the wording is Should vs. Shall. So he confirmed it is allowed to have external model sets. Arpad stated we allow models not referenced, and Bob confirmed it would be identified as a "Caution" issued by the Parser.

Michael Mirmak asked if this would require changes in IBIS future versions. The problem is the entire hierarchy is making assumptions about file and model relationships easy to misunderstand. Specifically, when he hit this particular set of problem, the models were being configured to show corner-cases, as options- and are not being described. Bob stated that this is not a corner case selection, it's just an option selection. So it could be a choice of a different structure- agnostic. Arpad suggested Michael's point was that he could write many models, and only one would be used, and the rest are unused corners in that particular simulation. Michael agreed. Bob stated he was not sure how to clarify this use case.

Bob stated the reason for Shall in 7.1 to Should in 7.2 to allow for the corner-case use case where some models may not be used in certain simulations, and to avoid modifying .ims or .ibs files themselves.
Bob restated to classify this as an Enhancement/Low Priority. Probably to be recommended for future release. Michael agreed because you won't run into the issue unless you run down the corner use cases. Arpad said if you had extra stuff from model making, and to clean up but it would not be critical if they forgot about it and were not warned about it. He asked if there were other situations where we could have this problem, and what does the parser do in those cases?
Bob is not sure what happened in those cases.
Arpad said he was just asking, but what does the Parser do for flagging.
Bob stated the floating models were the case in point- you are being informed you have a model floating and the reason is that there may be a link missing to a model. Here, it is a different situation.
Arpad asked if we should flag EMD files as well if this is the same type of situation.
Randy stated we could classify this and decide to implement it as a separate task.
Bob suggested to leave this open, but classify it as a Enhancement/Low Priority. Arpad seconded.

Bob stated BUG227 has been particularly concern, as a root name check. It is classified as will be fixed in the next release. The problem is that there are issues that cause Parser to hang. If you do not put in a symbol time, or incorrect symbol time, it just hangs. So the point is that under no conditions should the Parser stop or otherwise crash. There are other cases where it simply takes too long and appears as a crash by not terminating in a reasonable length of time (minutes as opposed to hours). One of the proposals is to put in a flag to enable/disable test. The rejection is because flags are only used to identify files. We may recommend in the contract not to deal with this bug in the current release- to defer to the next release. We don't

have time to evaluate this. The parser developer has not signed the contract for this parser. Bob proposed that due to us struggling with this, and the Parser developer proposed creating a new function, but that is not in the current spec, but we would have to change the IBIS specification to add that- as a function- and we as a quality committee did not come up with a solution- and maybe other contributors have a better idea for a solution.

Randy clarified that if we were to hard code all this information into AMI_INIT then there could be models that error-out due to missing symbol times or specific symbol times they do not support. Arpad suggested we could say ignore all other parameters and only respond to the request to provide root name response. The idea is we could avoid any instabilities, and the idea is the .dll/.so file would do nothing else but return the root name? Michael Mirmak stated his suggestion as an alternative- while appreciating Arpad's idea for coding discipline, is that the specification is unambiguous now root name needing to match. If there were an additional requirement for a special parameter, that might clue in model makers there is a problem. There is another options, where we delay this until [AMI Test Load] is available, and the only downside would be the matching would not be checkable if someone excluded [AMI Test Load]_NAME and [AMI Test Data].

Bob plans to revise the contract and remove this as a requirement. He will also see whether the Parser Developer can address the BUG240 crash in the same revision of the contract. And to have it just work for all 7.x versions of IBIS. We have also done this for other releases as a retro-active bug fix.

Arpad stated he would object to a function as that offloads to the EDA vendors- and a reserved parameter is easier to support.

Randy stated the discussion would be taken to IBIS quality task group.

There were no other discussion on the parser.

NEW TECHNICAL ISSUES

Randy reported that we have BIRD223 now with support for SPIM for IBIS.

Kinger Cai reported that in the IBIS ATM we had worked on the SPIM BIRD223, and thanked everyone for their support and contributions. We had been through 10 drafts, and have updated keywords and how the devices are called from the main IBIS file and the definitions of the details in the BIRD223. Kinger encouraged contributors to provide feedback on the most recent drafts to support PDN platform optimization more efficiently and consistently across EDA vendors and designers.

Randy reiterated that it is an open question as to whether SPIM should be its own topic as a link to an SPIM file under an IEEE standard, or if it would be a sub-chapter of the IBIS specification- which would be better implementation is an open question. We would like to get feedback on this issue which is more than whom have attended the ATM meetings.

Bob mentioned that it is not likely the SPIM would be within an IBIS file. Randy agreed. Bob stated to Kinger, if this would be an IEEE standard or specification, then it has to be joint-committee and it is too complicated to bring up a new committee from IEEE and bring this document into it. Kinger replied that he would like to add this SPIM model is one of the portion of the effort- and Zhiping is also leading to try to standard these. This focus is on the PDN and Chip side. Zhiping is trying to get all the keyword and VIM and inductance capacitance in the overall IBIS format. This is a partial effort and Zhiping is leading a larger effort in a separate meeting. As for the IEEE standard, Zhiping has been working with the IEEE side, indeed trying to make all the IBIS to be eligible for IEEE certification. Kinger asked Zhiping to clarify.

Zhiping responded in terms of the IEEE relationship, Randy had a discussion this morning – it would be that part of the IEEE society not difficult to setup a Committee to discuss certain topics- and as part of the committee Bob would be mentioned- I think Randy and Bob mentioned some potential issues with IP ownership could make it complicated. But we have had a lot of the discussion in the IBIS Technical Committee to invite IEEE members if they are interested. Within IEEE folks have to have membership to participate, both standard and the SIG group as well- so membership is more complicate to control and deal with. It is my preference.

Graham Kus stated that there may be precedence with the OIF issuing internetworking standards between optical modem and gearbox, which is then virtually adopted by the IEEE 802.3 workgroup. There is possibility that IEEE work group of some kind would be able to "adopt" IBIS specification as a standard for the appropriate work group.

Zhiping asked if the Interconnect Model were separate- Randy clarified that interconnect can exist either in or outside the IBIS file. This allows most of the data to be in an external SPIM file, but also it could be inside the same IBIS file.

Kinger stated this way it would be able to be copied directly into the IBIS file, or not- just an option.

Zhiping asked if the Parser were able to handle both cases- Randy clarified that it could deal with both SPIM as external files or as built-into the IBIS file itself.

Zhiping stated this seemed valuable capability for the future of IBIS, and re-iterated it would be helpful to keep the technical discussion within IBIS, and then invite IEEE to join us as our partners at that point.

Randy asked if there were questions on BIRD223. He encouraged people to read and comment on this BIRD223.

Kinger stated if anyone has feedback it is welcome, email his address or join the IBIS-ATM to make comments and thanked for contributors of this BIRD.

NEXT MEETING
Randy Wolff stated that the next IBIS Open Forum meeting date would be March 31, 2023. The following IBIS Open Forum meeting is scheduled for April 21, 2023. There were no objections.

Arpad Muranyi moved to adjourn. Michael Mirmak seconded. There were no objections. The meeting was adjourned.

==
NOTES

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This meeting was conducted in accordance with SAE ITC guidelines.

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 or unsubscribe from the official ibis@freelists.org and/or ibis-users@freelists.org email lists (formerly ibis@eda.org and ibis-users@eda.org):
    - https://www.freelists.org/list/ibis
    - https://www.freelists.org/list/ibis-users
- To subscribe to or unsubscribe from one of the task group email lists: ibis-macro@freelists.org, ibis-interconn@freelists.org, ibis-editorial@freelists.org, or ibis-quality@freelists.org:
    - https://www.freelists.org/list/ibis-macro
    - https://www.freelists.org/list/ibis-interconn
    - https://www.freelists.org/list/ibis-editorial

- o https://www.freelists.org/list/ibis-quality
- 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/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 (attendee X; absent -)

Organization	Interest Category	Standards Ballot Voting Status	Jan. 27, 2023	Feb. 3, 2023	Feb. 17, 2023	Mar. 10, 2023
Altair	User	Inactive	-	-	-	-
AMD (Xilinx)	Producer	Inactive	-	-	-	-
Analog Devices (Maxim Integrated)	Producer	Inactive	-	-	-	-
Ansys	User	Active	X	X	X	X
Applied Simulation Technology	User	Inactive	-	-	-	-
Aurora System	User	Inactive	-	X	-	-
Broadcom Ltd.	Producer	Inactive	-	-	-	-
Cadence Design Systems	User	Active	X	X	-	X
Celestica	User	Inactive	-	-	-	-
Cisco Systems	User	Inactive	-	X	-	-
Dassault Systemes	User	Inactive	-	X	-	-
GE Healthcare Technologies	User	Active	-	-	-	-
Google	User	Inactive	-	-	-	-
Huawei Technologies	Producer	Inactive	-	-	-	-
Infineon Technologies AG	Producer	Inactive	-	-	-	-
Instituto de Telecomunicações	User	Inactive	-	-	-	-
Intel Corp.	Producer	Active	X	X	X	X
Keysight Technologies	User	Inactive	-	-	-	-
Marvell	Producer	Inactive	-	X	-	X
MathWorks	User	Active	X	X	X	X
Micron Technology	Producer	Active	X	X	X	X
MST EMC Lab	User	Inactive	-	-	-	-
SerDesDesign.com	User	Inactive	-	X	-	-
Siemens EDA	User	Active	X	X	X	X
STMicroelectronics	Producer	Inactive	-	-	-	-
Synopsys	User	Active	X	X	X	X
Teraspeed Labs	General Interest	Active	X	X	X	X
Waymo	User	Active	-	-	X	X
ZTE Corp.	User	Inactive	-	-	-	-
Zuken	User	Active	X	X	-	X

= Temporarily not a voting member

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 (voting by email counts as attendance)

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.