**­­­­­IBIS Open Forum Minutes**

Meeting Date: **June 24, 2022**

Meeting Location: **Teleconference**

**VOTING MEMBERS AND 2022 PARTICIPANTS**

|  |  |
| --- | --- |
| AMD (Xilinx) | (Bassam Mansour) |
| Analog Devices (Maxim Integrated) | Tushar Pandey, Jermaine Lim, Rolynd Aquino, Aprille Hernandez-Loyol­­­­­­a, Janchris Espinoza, Francis Ian Calubag, Toni Rose Racelis, Thi Nhu Quynh Nguyen |
| ANSYS | Curtis Clark\* |
| Applied Simulation Technology | (Fred Balistreri) |
| Broadcom | (Yunong Gan), Jim Antonellis |
| Cadence Design Systems | Zhen Mu, Jared James, Ken Willis |
| Celestica | (Sophia Feng) |
| Cisco Systems | (Stephen Scearce) |
| Dassault Systemes | (Stefan Paret), Longfei Bai |
| Google | (Hanfeng Wang) |
| Huawei Technologies | (Hang (Paul) Yan) |
| Infineon Technologies AG | (Christian Sporrer) |
| Instituto de Telecomunicações | (Abdelgader Abdalla) |
| Keysight Technologies | Ming Yan, Fangyi Rao, Majid Ahadi Dolotsara, Pegah Alavi, Saish Sawant, [Radek Biernack] |
| Luminous Computing | (David Banas) |
| Marvell | Steven Parker\* |
| MathWorks | Graham Kus\*, Walter Katz, [Mike LaBonte]\* |
| Micron Technology | Randy Wolff, Aniello Viscardi, Justin Butterfield, Dragos Dimitriu |
| MST EMC Lab | (Chulsoon Hwang) |
| SerDesDesign.com | John Baprawski |
| Siemens EDA\* | Arpad Muranyi\*, Weston Beal\*, Amin Maher, Scott Wedge, Steve Kaufer, Todd Westerhoff, Vladimir Dmitriev-Zdorov, Ken Cantrell |
| Synopsys | Ted Mido\* |
| Teraspeed Labs | Bob Ross\* |
| Waymo | Zhiping Yang\* |
| ZTE Corporation | (Shunlin Zhu) |
| Zuken | (Michael Schäder) |
| Zuken USA | Lance Wang\* |

**OTHER PARTICIPANTS IN 2022**

|  |  |
| --- | --- |
| Amazon Lab126 | Ashkar Hashemi |
| Ampere Computing | Le Duy Quang |
| CEMWorks | Cielo Gerrie |
| Ciena | Hugues Tournier |
| Ericsson | (Guohua Wang) |
| IBM | Greg Edlund |
| Imperial College, UK | Cong Ling |
| Intel Corporation | Hsinho Wu, Michael Mirmak, Jingbo Li, Liwei Zhao |
| Mercury Systems | Vincent Tam |
| National Central University, Taiwan | Chiu-Chih Chou, Liu Huang Fu, Bohong Chai, Remxiang Xu, Kuan Fa, Yanting Li |
| OVT | Sirius Tsang |
| SAE ITC | José Godoy |
| SeriaLink Systems | Aleksey Tyshchenko, David Halupka |
| STMicroelectronics | (Olivier Bayet) |
| University of Colorado, Boulder, ECEE | Eric Bogatin |
| University of Illinois | José Schutt-Aine |
| Politecnico di Torino | Stefano Grivet Talocia, Tommaso Bradde, Marco De Stefano, Riccardo Trinchero, Alessandro Zanco, Antonio Carlucci |
| Unaffiliated | Mike LaBonte\* |

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](https://nam10.safelinks.protection.outlook.com/ap/t-59584e83/?url=https%3A%2F%2Fteams.microsoft.com%2Fl%2Fmeetup-join%2F19%253ameeting_MmIwNzhhNmItNzA1NC00ZTg1LWE0MDMtNGFiYzg1NDQ3MmE5%2540thread.v2%2F0%3Fcontext%3D%257b%2522Tid%2522%253a%2522fcbfc6fa-e20b-4a1d-b629-1b8e17697dbc%2522%252c%2522Oid%2522%253a%25227735c7ad-2577-4290-9e27-bce52c296030%2522%257d&data=04%7C01%7Ccurtis.clark%40ansys.com%7C31ef953a4d93460c286f08d90345d1fb%7C34c6ce6715b84eff80e952da8be89706%7C0%7C0%7C637544421277314270%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=zAeh7fCRElDR1NAQiiqHUfTwbTIg%2BkEQnkgGnEn65Kk%3D&reserved=0)

**Join with a video conferencing device**

[106010980@teams.bjn.vc](mailto:106010980@teams.bjn.vc)

Video Conference ID: 114 666 897 5

[Alternate VTC dialing instructions](https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fsupport.bluejeans.com%2Fknowledge%2Fvtc-dial-in-options-for-teams&data=04%7C01%7Ccurtis.clark%40ansys.com%7C31ef953a4d93460c286f08d90345d1fb%7C34c6ce6715b84eff80e952da8be89706%7C0%7C0%7C637544421277324259%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=1kD4GmLd%2BbdzErQBSHS1UPBmh0y5G8PlDlZUtMSsxkQ%3D&reserved=0)

**Or call in (audio only)**

[+1 267-768-8015,554664847#](tel:+12677688015,,554664847%23)   United States, Philadelphia

Phone Conference ID: 554 664 847#

[Find a local number](https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fdialin.teams.microsoft.com%2Fd1ae197a-e3fc-4c53-90b6-39fdeba65bc1%3Fid%3D554664847&data=04%7C01%7Ccurtis.clark%40ansys.com%7C31ef953a4d93460c286f08d90345d1fb%7C34c6ce6715b84eff80e952da8be89706%7C0%7C0%7C637544421277324259%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=N5Ha2rFhHG%2FIXyLoSEfS%2B1XYjLP9c1I8%2B%2BKSMNVgqgM%3D&reserved=0) | [Reset PIN](https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fmysettings.lync.com%2Fpstnconferencing&data=04%7C01%7Ccurtis.clark%40ansys.com%7C31ef953a4d93460c286f08d90345d1fb%7C34c6ce6715b84eff80e952da8be89706%7C0%7C0%7C637544421277334256%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=iKkTEbcyELtfgSacAxVtz%2BCU%2Fmsr5%2Bb04%2Bwg8PpOSH4%3D&reserved=0)

[Learn More](https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Faka.ms%2FJoinTeamsMeeting&data=04%7C01%7Ccurtis.clark%40ansys.com%7C31ef953a4d93460c286f08d90345d1fb%7C34c6ce6715b84eff80e952da8be89706%7C0%7C0%7C637544421277334256%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=2Udj6qD9gLjqoYgziYRQlGCwj7uJH4%2FQCDhrtMrFYdk%3D&reserved=0) | [Meeting options](https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fteams.microsoft.com%2FmeetingOptions%2F%3ForganizerId%3D7735c7ad-2577-4290-9e27-bce52c296030%26tenantId%3Dfcbfc6fa-e20b-4a1d-b629-1b8e17697dbc%26threadId%3D19_meeting_MmIwNzhhNmItNzA1NC00ZTg1LWE0MDMtNGFiYzg1NDQ3MmE5%40thread.v2%26messageId%3D0%26language%3Den-US&data=04%7C01%7Ccurtis.clark%40ansys.com%7C31ef953a4d93460c286f08d90345d1fb%7C34c6ce6715b84eff80e952da8be89706%7C0%7C0%7C637544421277344253%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=C5t3AZlfs3uti2goGqd28L%2FvDdjsizM1qfsUE05mJS4%3D&reserved=0)

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 (Secretary) declared that a quorum had been reached.

**CALL FOR PATENTS**

Lance Wang (Vice Chair) called for declaration of any patents or pending patents related to the IBIS, IBIS-ISS, ICM, or Touchstone 2.0 specifications. No patents were declared.

**REVIEW OF MINUTES AND ARS**

Lance Wang called for comments on the minutes of the June 3, 2022, IBIS Open Forum teleconference. Lance moved and Bob Ross seconded. There were no objections.

Lance reviewed ARs from the previous meeting.

* Michael Mirmak to add note to TSIRD4 that no parser change is required [AR].
  + Still open: Michael Mirmak not present.
* Curtis Clark to check that someone from each member company is subscribed to [ibis@freelists.org](mailto:ibis@freelists.org) [AR]
  + Done, Curtis found one company with no one subscribed and he contacted them.
* Zhiping Yang to get permission to use IEEE EMC Society Branding on our backdrop.
  + Done.
* Randy Wolff to start sending announcements for IEEE EMC+SIPI summit [AR]
  + Done.
* Randy Wolff to send new BIRD template to Steven Parker for posting [AR]
  + Done.

**ANNOUNCEMENTS**, **CALL FOR ADDITIONAL AGENDA ITEMS**

Graham Kus is now Secretary, taking over for Mike LaBonte at The MathWorks, Inc.

**MEMBERSHIP STATUS AND TREASURER'S REPORT**

Bob Ross (Treasurer) reports that with adjustments from past payments and credits, we currently had twenty-six renewal members for 2022. We had twenty-nine members until May 31, 2022. The following companies were temporarily moved to non-voting status for this meeting because payments have not been received by SAE ITC.

* **Ericsson (they may drop membership and should be dropped from the IBIS home page)**
* **Intel**
* **STMicroelectronics**

**\*Cadence** (will keep its voting status and is included in the twenty-six renewals above.  Payment was still pending but delayed because SAE ITC did not follow through on logging into the Cadence accounts payable system when notified at the end of April 2022.)

All sponsorship payments for the IBIS Summit at DesignCon were received. Little or no payments were anticipated for the IBIS Summit at IEEE EMC+SIPI because IEEE EMC planned to pay for the room and refreshments.

---

**$18,524** Balance for 2022

**$21,974** Adjusted Balance for 2022

---

**$450** Adjusted Balance for 2023

**WEBSITE ADMINISTRATION:**

Steven Parker reported that BIRD213 was updated to BIRD213.1. Also, that Ericsson had been removed from the homepage and poster page. Finally, Graham Kus was listed as Secretary on the website.

**MAILING LIST ADMINISTRATION**

Curtis Clark (Postmaster) reports:

Sent Graham information on how to subscribe.

**LIBRARY UPDATE**

Zhiping Yang (Librarian) Reports:

No updates on the library side.

**INTERNATIONAL/EXTERNAL ACTIVITIES**

Conferences:

The IEEE EMC+SIPI conference would be held in Spokane, Washington, August 1 to 5, 2022.

IEEE International Symposium on Electromagnetic Compatibility, Signal & Power Integrity (EMC+SIPI), August 1-5, 2022  
[https://emc2022.emcss.org](https://emc2022.emcss.org/)

Announcing the “Ask the Experts” Panels at the 2022 IEEE International Symposium on EMC+SIPI in Spokane, Washington  
 <https://ieeexplore.ieee.org/document/9780299>

Press Updates

None

Related standards

No discussion.

IEEE IBIS Standardization

Zhiping Yang said this had to wait until the Board had a discussion with SAE ITC.

**SUMMIT PLANNING AND REVIEW**

Lance Wang said there would be a Hybrid IBIS Summit planned concurrent with IEEE EMC+SIPI that had been scheduled for August 5, 2022.

The participants in the Expert Panel would not include some people who were listed as Panel Participants because they would not be able to attend onsite.

**QUALITY TASK GROUP**

Bob Ross said he is taking over the chair from Mike LaBonte. Bob reported the main topics have been review an IBIS Parser Contract for parser development for the next bug fix version of IBISCHK. There were eight bugs to be fixed as per the contract, two of which we had provided solutions for, six the parser developer would have to look at and provide a quote. This had been sent to SAE ITC for legal review before sending to the Parser Developer to provide a quote. There had been no reply from SAE ITC, Bob said he would follow up.

The actual contract had TBD but would have actual amount we would pay the Parser Developer and estimated delivery date, for a statement of work that would be IBISCHK version 7.0.2 with bug fixes. Bob also said they had been beginning to discuss a Touchstone parser update.

**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 (ATM Chair) announced that the group meets on Tuesdays at 12:00 a.m. PT. He reported they were talking about Power Integrity related topics. Some presentations had been given on how to standardize power modelling.

Zhiping Yang reported that Intel had started some discussion for on-die Power Integrity Modelling. We may see more at the upcoming IBIS Summit at the IEEE conference.

**Note:** Task group material can be found at:

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

**INTERCONNECT TASK GROUP**

Lance Wang said the group had not been meeting in Michael Mirmak’s absence.

**Note:** Task group material can be found at:

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

**EDITORIAL TASK GROUP**

Lance Wang said the group remained suspended.

**Note:** Task group material can be found at:

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

**NEW ADMINISTRATIVE ISSUES**

Mike LaBonte announced the results of the Officer Election. During the voting period which ended June 15, 2022: ten companies cast their votes for IBIS Officers. Nine of the voting companies were eligible to vote and their votes were counted. One company did not become eligible in time for their votes to be counted. Sixteen eligible member companies did not cast their votes.

The following Officers were elected:

|  |  |
| --- | --- |
| Chair | Randy Wolff, Micron Technology |
| Vice-Chair | Lance Wang, Zuken USA |
| Treasurer | Bob Ross, Teraspeed Labs |
| Secretary | Graham Kus, MathWorks |
| Webmaster | Steve Parker, Marvell |
| Librarian | Zhiping Yang, Waymo |
| Postmaster | Curtis Clark, ANSYS |

**New and Revised \*IRDs**

None.

**IRDs Scheduled for Vote**

None.

**IRDS Eligible for Vote**

**BIRD213.1: EXTENDING IBIS-AMI FOR PAMn ANALYSIS**

No discussion.

**BIRD219.1: AMI Parameter Root Name Clarification**

Arpad Muranyi said this was waiting for Michael Mirmak’s return.

**Tabled IRDs: (No Discussion Without Motion to "untable")**

No discussion.

**TSIRD4: [End] Keyword Corrections and Other Editorial Changes**

No discussion.

**IBISCHK AND TSCHK PARSER AND BUG STATUS**

Bob Ross said that Michael Schäder from Zuken had provided TSCHK2 code changes to speed up reading of Touchstone files. This was listed as TSCHK2 BUG5 in the TSCHK bug directory. A .zip file had been provided with four replacement source files and a presentation that describes the changes. Mike LaBonte said, in the code there are loops where data is read into memory as vector classes, where the vector is resized with every loop, but the code could be changed to allocate full size vectors before the loops at the beginning. We believe this would improve performance. Mike had verified that the modified source code appeared to have been based on the latest TSCHK2 source code. This was to be sure Michael S. had based his work on the most recent release.

**NEW TECHNICAL ISSUES**

No discussion.

**NEXT MEETING**

Normally the next IBIS Open Forum teleconference would have been held July 15, 2022. Lance Wang moved that the meeting be held July 22, 2022 instead due to member attendance conflicts. There were no objections. Lance said that due to IEEE SIPI IBIS Hybrid Summit would be held on August 5, 2022, therefore the IBIS Open Forum meeting on August 5 would have to push out to August 12, 2022. There were no objections.

Graham Kus moved to adjourn. Bob Ross seconded the motion. The meeting was adjourned.

========================================================================

**NOTES**

IBIS CHAIR: Randy Wolff (208) 363-1764

[rrwolff@micron.com](mailto:rrwolff@micron.com)

Principal Engineer, Silicon SI Group, Micron Technology, Inc.

8000 S. Federal Way

P.O. Box 6, Mail Stop: 01-720

Boise, ID 83707-0006

VICE CHAIR: Lance Wang (978) 633-3388

[lance.wang@ibis.org](mailto:lance.wang@ibis.org)

Solutions Architect, Zuken USA

238 Littleton Road, Suite 100

Westford, MA 01886

SECRETARY: Graham Kus

[graham.kus@ibis.org](mailto:graham.kus@ibis.org)

Senior Engineer, The MathWorks, Inc.

3 Apple Hill Drive

Natick, MA 01760

TREASURER: Bob Ross (503) 246-8048

[bob@teraspeedlabs.com](mailto:bob@teraspeedlabs.com)

Engineer, Teraspeed Labs

10238 SW Lancaster Road

Portland, OR 97219

LIBRARIAN: Zhiping Yang (650) 214-0868

[zhipingyang@google.com](mailto:zhipingyang@google.com)

Sr. Hardware Manager, Google LLC

1600 Amphitheatre Parkway

Mountain View, CA 94043

WEBMASTER: Steven Parker (845) 372-3294

[sparker@marvell.com](mailto:sparker@marvell.com)

Senior Staff Engineer, DSP, Marvell

2070 Route 52

Hopewell Junction, NY 12533-3507

POSTMASTER: Curtis Clark

[curtis.clark@ansys.com](mailto:curtis.clark@ansys.com)

ANSYS, Inc.

150 Baker Ave Ext

Concord, MA 01742

This meeting was conducted in accordance with SAE ITC guidelines.

All inquiries may be sent to [info@ibis.org](mailto: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](mailto:ibis@freelists.org) and/or [ibis-users@freelists.org](mailto:ibis-users@freelists.org) email lists (formerly [ibis@eda.org](mailto:ibis@eda.org) and [ibis-users@eda.org](mailto: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](mailto:ibis-macro@freelists.org), [ibis-interconn@freelists.org](mailto:ibis-interconn@freelists.org), [ibis-editorial@freelists.org](mailto:ibis-editorial@freelists.org), or [ibis-quality@freelists.org](mailto: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>
  + <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](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>

Other trademarks, brands and names are the property of their respective owners.

**SAE STANDARDS BALLOT VOTING STATUS (attendance X absent -)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Organization** | **Interest Category** | **Standards Ballot Voting Status** | **May 13, 2022** | **May 26, 2022** | **June 3, 2022** | **June 24, 2022** |
| AMD (Xilinx) | Producer | Inactive | - | - | - | - |
| Analog Devices (Maxim Integrated) | Producer | Inactive | - | X | - | - |
| ANSYS | User | Active | X | - | X | X |
| Applied Simulation Technology | User | Inactive | - | - | - | - |
| Broadcom Ltd. | Producer | Inactive | - | X | - | - |
| Cadence Design Systems | User | Active | X | - | X | - |
| Celestica | User | Inactive | - | - | - | - |
| Cisco Systems | User | Inactive | - | - | - | - |
| Dassault Systemes | User | Inactive | - | X | - | - |
| Google | User | Inactive | - | - | - | - |
| Huawei Technologies | Producer | Inactive | - | - | - | - |
| Infineon Technologies AG | Producer | Inactive | - | - | - | - |
| Instituto de Telecomunicações | User | Inactive | - | - | - | - |
| Intel Corp. | Producer | Active | X | - |  | = |
| Keysight Technologies | User | Active | X | - | X | - |
| Luminous Computing | General Interest | Inactive | - | - | - | - |
| Marvell | Producer | Active | X | - | X | X |
| MathWorks | User | Active | X | - | X | X |
| Micron Technology | Producer | Active | X | X | X | - |
| MST EMC Lab | User | Inactive | - | - | - | - |
| SerDesDesign.com | User | Inactive | - | - | - | - |
| Siemens EDA (Mentor) | User | Active | X | X | X | X |
| STMicroelectronics | Producer | Inactive | - | - | - | = |
| Synopsys | User | Active | X | - | X | X |
| Teraspeed Labs | General Interest | Active | X | X | X | X |
| Waymo | User | Active | X | - | X | X |
| ZTE Corp. | User | Inactive | - | - | - | - |
| Zuken | User | Active | X | 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.