UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner

v.

AX Wireless
Patent Owner.

IPR2023-01137
U.S. Patent 10,291,449

DECLARATION OF MATTHEW HINDMAN

I, Matthew Hindman, do hereby declare the following:

1. I submit this Supplemental Evidence Declaration at the request of Intel Corporation for consideration by the Patent Trial and Appeal Board in *Inter partes* review proceedings.

2. I am an attorney with the law firm of Perkins Coie LLP, and one of the counsel of record in this instituted IPR proceeding. I am over eighteen years of age, and I would otherwise be competent to testify as to matters set forth herein if called upon to do so.

3. The exhibit numbers referenced below correspond to numbered exhibits already filed in the Board's docket for this IPR proceeding.

4. Exhibit 1005 is an accurate copy of the published patent application No. US20060182017A1, which is available at the USPTO website: https://ppubs.uspto.gov/dirsearch-public/print/downloadPdf/20060182017.

5. Exhibit 1006 is an accurate copy of document: IEEE 802.11-05/0149r5 titled "WWiSE Proposal: High throughput extension to the 802.11 Standard" by Cenk Kose (Conexant Systems) and Matthew Fischer (Broadcom). Exhibit 1006 is available from the IEEE mentor database with a creation date of 2005-07-09: https://mentor.ieee.org/802.11/documents?n=37&is_group=000n.

6. Exhibit 1008 is an accurate copy of the published U.S. Patent Application No. US20050243774A1, which is available at the USPTO website:

https://ppubs.uspto.gov/dirsearch-public/print/downloadPdf/20050243774.

7. Exhibit 1009 is an accurate copy of U.S. Provisional Application No. 61235909 to Tzannes et al., which is available at the USPTO website: https://patentcenter.uspto.gov/applications/61235909.

8. Exhibit 1010 is an accurate copy of U.S. Patent No. 8,737,189 to Hansen et al., which is available at the USPTO website: https://ppubs.uspto.gov/dirsearch-public/print/downloadPdf/8737189.

9. Exhibit 1011 is an accurate copy of U.S. Provisional Application No. 60653429 to Hansen et al., which is available at the USPTO website: https://patentcenter.uspto.gov/applications/60653429.

10. Exhibit 1012 is an accurate copy of document: IEEE 802.11-04/0889r3 titled "TGn Sync Proposal Technical Specification" by Syed Aon Mujtaba (Agere Systems Inc.). Exhibit 1012 is available from the IEEE mentor database with a creation date of 2005-01-20: https://mentor.ieee.org/802.11/documents?n=38&is_group=000n.

11. Exhibit 1013 is an accurate copy of document: IEEE 802.11-04/0886r6 titled "WWiSE Proposal: High throughput extension to the 802.11 Standard" by Christopher Hansen and Bruce Edwards (both of Broadcom). Exhibit 1013 is available from the IEEE mentor database with a creation date of 2005-01-06: https://mentor.ieee.org/802.11/documents?n=39&is_group=000n.

12. Exhibit 1014 is an accurate copy of published U.S. Patent Application No. US20070115802A1 to Yu et al., which is available at the USPTO website: https://ppubs.uspto.gov/dirsearch-public/print/downloadPdf/20070115802.

13. Exhibit 1015 is an accurate copy of IEEE Std 802.11a-1999, "Supplement to IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific Requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Highspeed Physical Layer in the 5 GHz Band," dated as approved on 16 September 1999. Exhibit 1015 is available for purchase or viewing at the IEEE website: https://standards.ieee.org/access-standards/.

14. Exhibit 1017 is an accurate copy of IEEE Std. 802.11n-2009, titled "IEEE Standard for Information Technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 5: Enhancements for Higher Throughput," and dated 29 October 2009. Exhibit 1017 is available for purchase or viewing at the IEEE website: https://standards.ieee.org/access-standards/.

15. Exhibit 1018 is an accurate copy of ITU-T Draft Recommendation G.9960 titled Next generation wireline based home networking transceivers —

Foundation" (*see* Ex. 1018 at p. 4). Ex. 1018 is part of the Appendix of U.S. Provisional Application No. 61235909 to Tzannes et al. (*see* Ex. 1009). The Provisional Application cites Ex. 1018 as a reference sourced from ITU-T SG15/Q4 dated Jan. 2009 (*see* Ex. 1009 at p. 8 of 133) and is available at the USPTO website: https://patentcenter.uspto.gov/applications/61235909.

16. Exhibit 1019 is an accurate copy of ITU – Telecommunication Standardization Sector, Temporary Document 09XC-119 titled "G.hn: Extended PHY frame header," identifying Intellon Corporation as the Source and dated 31 July 2009. Exhibit 1019 is part of the Appendix of U.S. Provisional Application No. 61235909 to Tzannes et al. (*see* Ex. 1009). The Provisional Application cites Ex. 1019 as a reference (*see* Ex. 1009 at p. 9 of 133) and is available at the USPTO website: https://patentcenter.uspto.gov/applications/61235909.

17. Exhibit 1020 is an accurate copy of ITU – Telecommunication Standardization Sector, Temporary Document 09XC-100 titled "G.hn Using Two Symbols for the Header of a PHY frame on Coax," identifying CopperGate Communication as the Source and dated July 27–31, 2009. Exhibit 1020 is part of the Appendix of U.S. Provisional Application No. 61235909 to Tzannes et al. (*see* Ex. 1009). The Provisional Application cites Ex. 1020 as a reference (*see* Ex. 1009 at p. 9 of 133) and is available at the USPTO website: https://patentcenter.uspto.gov/applications/61235909.

18. Exhibit 1021 is an accurate copy of an article by Josip Lorincz and Dinko Begusic of the University of Split in Croatia entitled "Physical Layer Analysis of Emerging IEEE 802.11n WLAN Standard" identified as published in 2006 8th International Conference Advanced Communication Technology, conference date of 20-22 February 2006, ISBN:89-5519-129-4. Exhibit 1021 is available at the IEEE website: https://ieeexplore.ieee.org/document/1625554.

19. Exhibit 1022 is an accurate copy of the published book "OFDM for Wireless Multimedia Communications" by Richard van Nee and Ramjee Prasad, ISBN 0-89-6-530-6, Library of Congress Catalog Card Number 99-052312 (Artech House 2000).

20. Exhibit 1023 is an accurate copy of the published book "Multi-Carrier Digital Communications, Theory and Applications of OFDM, Second Edition," by Ahmad R.S. Bahai (National Semiconductor, Stanford University, and the University of California Berkeley), Burton R. Saltzberg (Formerly Bell Laboratories), and Mustafa Ergen (University of California Berkeley), ISBN: 978-0-387-22575-3, Library of Congress Control No. 2004052575 (Springer 2004).

21. Exhibit 1024 is an accurate copy of the published book "Fundamentals of Wireless Communication," by David Tse (University of California, Berkeley) and Pramod Viswanath (University of Illinois, Urbana-Champaign), ISBN-13 978-0-521-84527-4 (Cambridge University Press 2005).

22. Exhibit 1025 is an accurate copy of the published book "OFDM Wireless LANs: A Theoretical and Practical Guide," by Juha Heiskala and John Terry, Ph.D. (Nokia), ISBN 0-672-32157-2 (Sams Publishing, 2001).

23. Exhibit 1027 is an accurate copy of the article "Stage set for compromise on IEEE high-speed wireless," by John Cox. The article states that it was accessible at http://networkworld.com/article/2319437/stage-set-for-compromise-on-ieee-high-speed-wireless.html. Attached as Appendix B to this declaration is an accurate printout of the same article from the Internet Archive (also known as the Wayback Machine) for the www.networkworld.com URL as of March 22, 2005. *See* https://web.archive.org/web/20050322045333/http://www.nwfusion.com/news/2005/032105-wireless-80211n.html.

24. Exhibit 1028 is an accurate copy of the article "New Wi-Fi standard takes the slow road," by Marguerite Reardon, dated May 20, 2005, and available at https://www.cnet.com/home/internet/new-wi-fi-standard-takes-the-slow-road/.

25. Exhibit 1029 is an accurate copy of document: IEEE 802.11-05/786r0, titled "TGn Sync, WWiSE and Mitmot closing report" by Syed Aon Mujtaba (Agere Systems), Christopher Hansen (Broadcom) and Marc de Courville (Motorola). Exhibit 1029 is available from the IEEE mentor database with a creation date of 2005-07-21:

https://mentor.ieee.org/802.11/documents?n=37&is_group=000n.

26. Exhibit 1030 is an accurate copy of document: IEEE 802.11-05/0737r0, titled "WWiSE IEEE 802.11n Proposal" by Sean Coffee (RealTek). Exhibit 1030 is available from the IEEE mentor database with a creation date of 2005-07-19: https://mentor.ieee.org/802.11/documents?n=37&is_group=000n.

27. Exhibit 1031 is an accurate copy of the published book "802.11 Wireless Networks, The Definitive Guide," by Mathew S. Gast, ISBN 0-596-00183-5 (O'Reilly Media, Inc. 2002).

28. Exhibit 1033 is an accurate copy of U.S. Patent No. 7,415,074 to Seto et al., which is available at the USPTO website: https://ppubs.uspto.gov/dirsearch-public/print/downloadPdf/7415074.

29. Exhibit 1034 is an accurate copy of the paper by Adrian Stephens, "802.11 'Decrypted,'" from ACM SIGCOMM Computer Communication Review, Vol. 35, Number 2, April 2005, beginning at p. 91.

30. Exhibit 1035 is an accurate copy of an article by Russell Kay titled "Sidebar: The Battle for 11n," and dated March 13, 2006. This article is available at the Computerworld website: https://www.computerworld.com/article/2563102/sidebar--the-battle-for-11n.html. This article is also available in the records of the Internet Archive (also known as the Wayback Machine) for the www.computerworld.com URL as of March 15,

2006 available at https://web.archive.org/web/20060315000946/http://www.computerworld.com/mobiletopics/mobile/story/0,10801,109413,00.html. Attached as Appendix C to this declaration is an accurate printout of the article from the Wayback Machine for March 15, 2006.

31. Exhibit 1036 is an accurate copy of the February 24, 2005 article "'WWiSE' Consortium, Motorola Team on Proposal for IEEE 802.11n." The article is available at https://www.rfglobalnet.com/doc/wwise-consortium-motorola-team-on-proposal-fo-0001.

32. Exhibit 1037 is an accurate copy of a February 24, 2005 press release titled "'WWiSE' Consortium and Motorola Team to Offer Enhanced Proposal for IEEE 802.11n." Exhibit 1037 is available in the records of the Internet Archive (also known as the Wayback Machine) for the www.wise.org URL as of April 6, 2005 and available at https://web.archive.org/web/20050406073808/http://www.wwise.org/pressreleasefeb23.htm. Attached as Appendix D to this declaration is an accurate printout of this press release from the Wayback Machine for April 6, 2005.

33. Exhibit 1038 is an accurate copy of document: IEEE 802.11-04/422r4, titled "New Participant Orientation" and dated July 2004. Exhibit 1038 is available from the IEEE mentor database:

https://mentor.ieee.org/802.11/dcn/04/11-04-0422-04-0000-new-participant-orientation.ppt.

34. Exhibit 1039 is an accurate copy of document: IEEE 802.11-04/736r1, titled "Approved Minutes of the IEEE P802.11 Full Working Group" and dated July 2004. Exhibit 1039 is available at: http://grouper.ieee.org/groups/802/11/Minutes/Cons_Minutes_July-2004.pdf.

35. Exhibit 1040 is an accurate copy of the published book "The IEEE 802.11 Handbook," by Bob O'Hara and Al Petrick, ISBN 0-7381-1855-0, Library of Congress Control No. 99-057887 (IEEE 1999).

36. Exhibit 1045 is an accurate copy of the Docket Control Order, Dkt. 62, in *Lightguide, Inc. v. Amazon.com, Inc., et al*., Case 2:22-cv-00433-RWS-RSP filing date of 5/15/23 (EDTX). Exhibit 1045 is available from Eastern District of Texas Pacer system.

37. Exhibit 1046 is an accurate copy of the Docket Control Order, Dkt. 38, in *Textron Innovations Inc. v. SZ DJI Technology Col, Ltd., et al*., Case 2:22-cv-00351-RWS-RSP filing date of 5/11/23 (EDTX). Exhibit 1046 is available from Eastern District of Texas Pacer system.

38. Attached as Appendix A to this declaration is an accurate copy of the notarized declaration of Nathaniel E. Frank-White. Mr. White's declaration states that he is a Records Request Processor at the Internet Archive, which has a service

known as the Wayback Machine. The declaration details how the Wayback Machine can be used to retrieve archived copies of information captured from Internet websites by date as reflected in the Wayback Machine archive. The White declaration is available in the PTAB docket for *Intel Corporation v. BiTMICRO LLC*, PTAB-IPR2023-00783 at Exhibit 1047.

I hereby declare that all the statements made in this Declaration are true and of my own personal knowledge; that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements are punishable by fine or imprisonment, or both, under 18. U.S.C. § 1001, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on March 12, 2024 in Reno, NV.

/ s/ Matthew Hindman
Matthew Hindman

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), I certify that on March 12, 2024, a true and correct copy of the foregoing **DECLARATION OF MATTHEW HINDMAN** was served by electronic mail on Petitioner's lead and backup counsel at the following email addresses:

S. Giri Pathmanaban
giri.pathmanaban@lw.com
Inge A. Osman (Reg. No. 74,480)
inge.osman@lw.com
Amit Makker (Reg. No. 68,086)
amit.makker@lw.com
Allison Harms
allison.harms@lw.com
Diane E. Ghrist
diane.ghrist@lw.com
Jacob Vannette
jake.vannette@lw.com
David J. Hlavka
david.hlavka@lw.com

Date: March 12, 2024

/ Matthew Hindman /
Matthew Hindman

Appendix A

AFFIDAVIT OF NATHANIEL E FRANK-WHITE

1. I am a Records Request Processor at the Internet Archive. I make this declaration of my own personal knowledge.

2. The Internet Archive is a website that provides access to a digital library of Internet sites and other cultural artifacts in digital form. Like a paper library, we provide free access to researchers, historians, scholars, and the general public. The Internet Archive has partnered with and receives support from various institutions, including the Library of Congress.

3. The Internet Archive has created a service known as the Wayback Machine. The Wayback Machine makes it possible to browse more than 450 billion pages stored in the Internet Archive's web archive. Visitors to the Wayback Machine can search archives by URL (i.e., a website address). If archived records for a URL are available, the visitor will be presented with a display of available dates. The visitor may select one of those dates, and begin browsing an archived version of the Web. Links on archived files in the Wayback Machine point to other archived files (whether HTML pages or other file types), if any are found for the URL indicated by a given link. For instance, the Wayback Machine is designed such that when a visitor clicks on a hyperlink on an archived page that points to another URL, the visitor will be served the archived file found for the hyperlink's URL with the closest available date to the initial file containing the hyperlink.

4. The archived data made viewable and browsable by the Wayback Machine is obtained by use of web archiving software that automatically stores copies of files available via the Internet, each file preserved as it existed at a particular point in time.

5. The Internet Archive assigns a URL on its site to the archived files in the format http://web.archive.org/web/[Year in yyyy][Month in mm][Day in dd][Time code in hh:mm:ss]/[Archived URL] aka an "extended URL". Thus, the extended URL http://web.archive.org/web/19970126045828/http://www.archive.org/ would be the URL for the record of the Internet Archive home page HTML file (http://www.archive.org/) archived on January 26, 1997 at 4:58 a.m. and 28 seconds (1997/01/26 at 04:58:28). The date indicated by an extended URL applies to a preserved instance of a file for a given URL, but not necessarily to any other files linked therein. Thus, in the case of a page constituted by a primary HTML file and other separate files (e.g., files with images, audio, multimedia, design elements, or other embedded content) linked within that primary HTML file, the primary HTML file and the other files will each have their own respective extended URLs and may not have been archived on the same dates.

6. Attached hereto as Exhibit A are true and accurate copies of browser screenshots of the Internet Archive's records of the archived files for the URLs and the dates specified in the attached coversheet of each printout.

INTERNET ARCHIVE
archive.org

7. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

DATE: 01/17/2024

Nathaniel Frank-White
Nathaniel E Frank-White

Please see attached All Purpose Jurat form for additional Notary Events

EXHIBIT A

https://web.archive.org/web/19980128163454/http://www.uspto.gov/web/offices/ac/ido/ptdl/apsdef.htm

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PTDLP

Patent and Trademark Depository Library Program

What is APS?

APS is the Automated Patent System used by the U.S. Patent and Trademark Office (PTO) and its examiners for patent search and retrieval. APS has full text of every patent from 1971 to the present and a complete image of every U.S. patent back to 1790. It is updated every Tuesday with approximately 2,000 newly issued patents. APS contains reexaminations and certificates of correction. It also has English language abstracts of unexamined Japanese patent applications published from 1980 to the present. There are two kinds of APS databases: **APS Text and APS Image**.

What is the difference between APS Text and APS Image?

APS TEXT provides the primary search capability. The APS Text is a full text database of U.S. patents from 1971 to the most current issued patent. Over 60 indexes allow highly focused, refined searching in the various fields of a patent. More than 50 formats are available for displaying search results.

APS IMAGE has all patent images, including full text, from 1790 to the most current issued patent. The image workstation includes APS Text capabilities so that the patents retrieved in a text search can also be viewed in an image format.

How does APS Image work?

Each APS Image workstation has two screens and a dedicated printer. The left screen is command and search specifications; the right screen displays the patent images. It is possible to retrieve, view and print a series of patents with the touch of the mouse. Users can quickly search a class and subclass (or do a more complex and comprehensive search to identify patents of potential interest), and browse each patent (one page or a section at a time), prin ting selectively those patents they need.

What are the advantages of the system?

It is comprehensive. The image database has every U.S. patent issued since George Washington signed the first patent in 1790. The text database is fully searchable back to 1971 with over 60 search fields. No other database in the world has the complete collection of U.S. patents through date of issue, all on-line.

It is up-to-date. APS is updated each Tuesday the day the patents issue and these new patents are available on-line that morning.

It is accurate. Reclassification information is automatically added. Unlike other databases, all patents in the system are automatically updated and cross-referenced. As a result, a class/subclass search doesn't miss the earlier patents issued under previously used classes or subclasses.

It is fast. One user logged onto APS Image and searched 148 patents in less than an hour. He printed the ones he found relevant and saved two days of search and retrieval time.

It is flexible. Standard Boolean and specific proximity operators may be used in searching. APS Text also provides keyword searching and provides for truncation at the beginning, as well as within and at the end of a term.

It is less expensive than other on-line systems.

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Can I access APS from my office?

No. APS is not publicly available except from certain locations. Patent and Trademark Depository Libraries (PTDLs) are permitted to subscribe to APS text. PTDL Partnership libraries at Sunnyvale Center for Innovation, Invention and Ideas (SCI³) in Sunnyvale, California and Great Lakes Patent and Trademark Center (GLPTC) at the Detroit Public Library in Detroit, Michigan have APS Text and Image access. APS Text and Image workstations are also available in the public search facilities at the USPTO in Arlington, Va.

MORE INFORMATION USPTO HOME PAGE PTDL HOME PAGE

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A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF Texas }

COUNTY OF Tarrant }

The foregoing instrument was subscribed and sworn before me this date of 01/17/2024, by Nathaniel Frank-White

This notarial act was an online notarization.

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BRITTANY RENE COPELAND
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STATE OF TEXAS
NOTARY ID: 133645929
COMISSION EXP: MARCH 15 2026

(Notary Seal)

Notary's Signature

Registration No.: 133645929

Commission Expiration Date: March 15, 2026

Appendix B

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Stage set for compromise on IEEE high-speed wireless

By John Cox
Network World, 03/21/05

BREAKING NEWS
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ATLANTA - The IEEE task group charged with creating a 100M bit/sec wireless LAN standard has set the stage for a compromise between the two remaining factions.

Advertisement:

Members of the TGn Sync and World Wide Spectrum Efficiency (WWiSE) organizations might be ready to negotiate on a proposal that could win 75% of the votes at the next meeting of 802.11n task group. That's the number needed for a proposal to be adopted as a draft standard. Otherwise, the group will take a step backward and begin to reconsider proposals that had been eliminated.

The group's job is to create a wireless-LAN standard that will deliver actual throughput of more than 100M bit/sec, a quantum leap above the 20M bit/sec for today's 802.11g and 11a WLANs. The current 802.11 standard eats up more than half of the 54M bit/sec data rate for 802.11g and 11a. The higher, though still shared, bandwidth will rival that of many wired networks and support demanding applications such as several video and audio streams at once, huge image files and simulations.

"Both sides realize that a standard has to come as quickly as possible," says Jack Winters, chief scientist at Motia, a Pasadena, Calif., fabless semiconductor company designing radio chips that integrate with smart antennas. Winter is a member of the 802.11n task group but is not affiliated with TGn Sync or WWiSE. "Delays or deadlocks will result in both groups failing," he says.

Last week in Atlanta, members of the 802.11n task group continued winnowing proposals. They voted by a slender majority in favor of one proposal from a group of vendors called TGn Sync. But the next day, in the confirmation vote, that proposal fell far short of the 75% majority it needed to be adopted as the draft 802.11n standard.

The members of TGn Sync include chip makers such as Atheros, Intel and Marvel, network equipment makers such as Cisco and Nortel, and consumer products companies such as Panasonic, Samsung and Sony. WWiSE members include Airgo Networks, Broadcom, Connexant, Motorola and Texas Instruments, along with Buffalo Technology, Hughes Network Systems, France Telecom, Nokia and NTT.

Both proposals (see more details) make use of technology called multiple input/multiple output (MIMO) to dramatically boost the amount of data that can be sent over a radio connection. MIMO-based WLAN products already are on the market based on Airgo's chipset, which is the only one shipping in volume.

"Neither one has the votes for 75% right now, unless there's an official compromise," says Greg Raleigh, CEO of Airgo, and author of one of the earliest academic papers on MIMO. "We're not even at Draft 1.0 yet. And after that, you have to design [a standard] that you can actually build [products] to, and interoperate."

There already has been compromise, Motia's Winters says, as both groups have made changes in their proposals. TGn Sync dropped a requirement to use 40-MHz channels instead of the conventional 20 MHz; now the bigger channel is an option. WWiSE added support for transmit beam forming, which is a technique for boosting performance by using antenna arrays that in effect focus radio signals.

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Motorola and Texas Instruments, along with Buffalo Technology, Hughes Network Systems, France Telecom, Nokia and NTT.

Both proposals (see more details) make use of technology called multiple input/multiple output (MIMO) to dramatically boost the amount of data that can be sent over a radio connection. MIMO-based WLAN products already are on the market based on Airgo's chipset, which is the only one shipping in volume.

"Neither one has the votes for 75% right now, unless there's an official compromise," says Greg Raleigh, CEO of Airgo, and author of one of the earliest academic papers on MIMO. "We're not even at Draft 1.0 yet. And after that, you have to design [a standard] that you can actually build [products] to, and interoperate."

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Sidebar: The Battle for 11n

News Story by Russell Kay

MARCH 13, 2006 (COMPUTERWORLD) - When we talk of the IEEE's forthcoming 802.11n standard for high-speed (200Mbit/sec. and up) wireless networks, it's important to note that we're not yet sure what technology it will encompass. Currently, two groups are pushing different approaches. One consortium is the World Wide Spectrum Efficiency (WWiSE), and the other has the rather odd name of TGn Sync (short for Task Group N of the IEEE 802.11 Working Group). First proposals were made in 2004, and there is little hope for agreement before this summer.

TGn Sync is a group of more than 25 companies across cellular, computing, consumer electronics, enterprise networking, mobile radio, public access and semiconductor markets. It is spearheaded by Agere Systems Inc., Atheros Communications Inc., Intel Corp., Nokia Corp, Philips Electronics NV and Sony Corp. The TGn Sync proposal expects to deliver speeds of around 313Mbit/sec. using two antennas and 40-MHz channels.

WWiSE is led by MIMO pioneer Airgo Networks Inc., with other wireless chip-set manufacturers, including Broadcom Corp., Conexant Systems Inc., STMicroelectronics NV and Texas Instruments Inc. The WWiSE proposal requires only a 20-MHz channel (which the group believes is friendlier to all countries) and provides better efficiency. Speeds would start at 135Mbit/sec., with two transmitting antennas mandatory. More antennas would be optional, as would a 40-MHz mode, and these could drive data rates up to 540Mbit/sec.

Currently, TGn Sync's proposal has more proponents but still not enough support for a final decision. In the end, whichever proposal can win 75% of the vote will determine the standard. Best guess is that an 802.11n specification will be published in 2007.

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Press Release - February 24

"WWiSE" Consortium and Motorola Team to Offer Enhanced Proposal for IEEE 802.11n

Industry Support Surges for WWiSE's Straightforward, Spectrum-Efficient, Rapid Time-to-Completion Approach for Next Generation Wi-Fi Standard

DALLAS (February 24, 2005) — The World Wide Spectrum Efficiency (WWiSE) consortium, a group of 12 companies which developed a complete proposal for the IEEE 802.11 Task Group N (TGn), today announced a merger of technical proposals with Motorola, Inc. Motorola had previously developed a separate proposal but will now work as part of the WWiSE consortium on an enhanced proposal that will be submitted to the IEEE 802.11 TGn for consideration. TGn is chartered with developing a next-generation Wi-Fi standard capable of sustaining data throughput in excess of 100Mbps. The other members of the WWiSE consortium are Airgo Networks, Broadcom Corporation, Buffalo, Conexant Systems, Inc., ETRI, Hughes Network Systems, Ralink Technology, Realtek, STMicroelectronics, Texas Instruments, TrellisWare Technologies and Winbond Electronics.

"Motorola believes the IEEE 802.11n standard is an important building block for offering connectivity to high bandwidth services in the home and enterprise environment," said Miguel Pellon, vice president technology-standards, Motorola, Inc. "We believe our experience in making applications such as mobile VoIP and mobile multimedia streaming operate in handheld devices and our expertise in power saving mechanisms strengthen the WWiSE proposal for 802.11n."

The updated WWiSE proposal will continue to build on the existing and globally adopted 20MHz channel format of the tens of millions of Wi-Fi devices already in use. This approach ensures support for the existing worldwide installed base, while improving the performance of Wi-Fi networks within the designated RF spectrum. Motorola's contributions to the revised WWiSE proposal will enhance the pre-existing specification by improving range, reach and robustness for the various operating modes.

Highlights of the Enhanced WWiSE proposal

Key features of the combined WWiSE proposal include:

1. Mandatory use of the approved, pre-existing, worldwide 20MHz Wi-Fi channel width, assuring immediate applicability and deployment in all regulatory jurisdictions.
2. Enhanced MIMO technology that enables a maximum data rate of 135 Mbps in the minimum mandatory 2x2 configuration and a single 20MHz channel to keep implementation costs low, while greatly improving upon simple antenna additions or channel bonding schemes.
3. Mandatory modes affording backwards compatibility and interoperability with existing Wi-Fi devices in the 5 GHz and 2.4 GHz bands to ensure strong support of legacy deployments.
4. Enhancements that improve robustness and range for all modes of operations and data rates.
5. Modes of operation specifically intended for mobile, battery-powered applications and devices such as handsets and cell phones.
6. Advanced forward-error-correction coding option to facilitate maximum coverage and range, applicable in all MIMO configurations and channel bandwidths.
7. Rates up to 540 Mbps, accomplished with a 4x4 MIMO structure and optional 40MHz channel width (where permissible by regulatory bodies), provide a clear and extensible roadmap for future devices and applications.
8. Provisions for advanced features that improve data rate and range such as beam-forming and closed loop methods.

"Motorola's joining with WWiSE is a strong endorsement of the fundamental technical direction adopted by WWiSE to improve spectral efficiency and improve range and robustness. Their contributions enrich the proposal in a manner consistent with these objectives," said Jim Zyren, WWiSE spokesperson and director of marketing, wireless networking business unit, Conexant Systems, Inc. "The updated WWiSE proposal is now in a state that can be quickly adopted as the baseline draft standard for 802.11n."

Next Steps

The WWiSE proposal is one of two remaining proposals set to be considered by IEEE 802.11 Task Group N at its next meeting during the week of March 14 in Atlanta, GA. At this session, one proposal could be selected as the baseline for the new standard. With momentum growing for the WWiSE proposal, more companies are soon expected to join the effort and help support its acceptance at upcoming meetings.

WWiSE has recently updated its Intellectual Property offer for essential patents embodied in the WWiSE proposal. It remains fully consistent with IEEE requirements known as RAND (Reasonable and Non-Discriminatory). WWiSE companies will offer their essential IP under RAND terms, the basic requirement for anyone wishing to participate in IEEE standards setting processes. Likewise, any company may join and support WWiSE so long as they adhere to the IEEE IP rights policies and procedures. Further information about WWiSE and the updated WWiSE proposal to IEEE 802.11 TGn may be found at http://www.wwise.org.

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About Airgo Networks, Inc.
The founders of Airgo Networks have pioneered a wireless communication technique known as Multiple Input Multiple Output (MIMO) Orthogonal Frequency Division Multiplexing (OFDM). A breakthrough in wireless, MIMO OFDM has been adopted as the foundation for defining the new IEEE 802.11n standard for next generation Wi-Fi(r). Airgo is first-to-market with 802.11a/b/g-compliant MIMO enhanced chipset, software and reference design solutions. Airgo's True MIMO(tm) technology substantially improves performance and reliability, enabling the most bandwidth-intensive applications and eliminating the need for wires at home, at work, and in public places. Founded in January 2001, the company is headquartered in Palo Alto, California, USA. More information is available at www.airgonetworks.com.

About Broadcom
Broadcom Corporation is a global leader in wired and wireless broadband communications semiconductors. Our products enable the convergence of high-speed data, high definition video, voice and audio at home, in the office and on the go. Broadcom provides manufacturers of computing and networking equipment, digital entertainment and broadband access products, and mobile devices with the industry's broadest portfolio of state-of- the-art system-on-a-chip and software solutions. These solutions support our core mission: Connecting everything®. Broadcom is one of the world's largest fabless semiconductor companies, with annual revenue of more than $2 billion. The company is headquartered in Irvine, Calif., with offices and research facilities in North America, Asia and Europe. Broadcom may be contacted at 1-949-450-8700 or at www.broadcom.com.

About Buffalo Technology
With offices in Japan, USA, Germany, Sweden, UK, Ireland, Taiwan and Korea, Buffalo Technology is a global leader in the design, development and manufacture of wireless networking solutions. Providing wireless, broadband and LAN networking solutions for the SME, SOHO and home markets, Buffalo Technology is the second largest wireless networking hardware vendor in the world. Buffalo's strong international industry alliances with companies including Intel, Texas Instruments, Agere and Microsoft have allowed Buffalo to continue to lead the industry in the development of the latest technologies into practical, easy to use tools for business and the home. With Global manufacturing facilities accredited to ISO9002, Buffalo Technology is a world class provider of IT solutions. Buffalo Technology is a wholly owned subsidiary of Melco Inc. Group.

About Conexant
Conexant's innovative semiconductor solutions are driving broadband communications, enterprise networks and digital home networks worldwide. The company has leveraged its expertise and leadership position in modem technologies to enable more Internet connections than all of its competitors combined, and continues to develop highly integrated silicon solutions for broadband data and media processing networks. Key products include client-side xDSL and cable modem solutions, home network processors, broadcast video encoders and decoders, digital set-top box components and systems solutions, and dial-up modems. Conexant's suite of networking components includes a leadership portfolio of IEEE 802.11a/b/g-compliant WLAN chipsets, software and reference designs, as well as solutions for applications based on HomePlugSM and HomePNA™. The company also offers a complete line of asymmetric and symmetric DSL central office solutions, which are used by service providers worldwide to deliver broadband data, voice, and video over copper telephone lines. Conexant is a fabless semiconductor company that recorded more than $900 million in revenues in fiscal year 2004. The company has approximately 2,400 employees worldwide, and is headquartered in Newport Beach, Calif. To learn more, please visit us at www.conexant.com.

About ETRI
Established in 1976, ETRI (Electronics and Telecommunications Research Institute) is a non-profit government-funded research organization that has been at the forefront of technological excellence for more than 25 years. Our research institute has successfully developed information technologies such as TDX-Exchange, High Density Semiconductor Microchips, Mini-Super Computer (TiCOM), and Digital Mobile Telecommunication System (CDMA). As a recognized leader in the information and telecommunication research institute in Korea, we will strive to be the best in the fields of information and telecommunications. In the 21st century, by combining knowledge and information with computer and telecommunication, we will open the door to the future multimedia and telecommunication age. For more information, visit us at www.etri.re.kr.

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About Motorola
Motorola is a Fortune 100 global communications leader that provides seamless mobility products and solutions across broadband, embedded systems and wireless networks. In your home, auto, workplace, and all spaces in between, seamless mobility means you can reach the people, things and information you need, anywhere, anytime. Seamless mobility harnesses the power of technology convergence and enables smarter, faster, cost-effective and flexible communication. Motorola had sales of US $31.3 billion in 2004. For more information: www.motorola.com.

About Ralink
Ralink Technology is a leading developer of wireless chipsets dedicated to the IEEE 802.11x standards, with emphasis on high performance, low cost, strong support and fast delivery. Its product portfolio includes 11b, 11b/g and 11a/b/g complete chipset solutions, which propel a broad range of networking devices and notebooks globally. Currently, the company is offering adaptive antenna chipset that achieves MIMO performance in stability and range with legacy devices. In addition, the company is working with industry alliance to develop advanced 11n and 11n SoC solutions that will incorporate its MIMObilityTM technology to raise wireless speed to wireline levels. The headquarters is in Hsinchu, Taiwan, and its R&D is jointly performed in Hsinchu and Cupertino, California. For more information, visit www.ralinktech.com.tw or send email to info@ralinktech.com.

About Realtek
Realtek Semiconductor Corp., located in the Hsinchu Science-based Industrial Park — Taiwan's "Silicon Valley" — began with a small group of young, devoted engineers in 1987. In nearly two decades, these young founding engineers built Realtek into one of the world's largest and most successful IC design houses. Realtek's efforts to provide the ultimate in pioneering IC technology — along with its firm commitment to creating unique and innovative designs for a broad range of high-tech applications — have won the company a worldwide reputation and made possible a favorable and consistent growth rate in the years since its establishment. We attribute this achievement to Realtek's tradition of excellence. Please

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About Motorola
Motorola is a Fortune 100 global communications leader that provides seamless mobility products and solutions across broadband, embedded systems and wireless networks. In your home, auto, workplace, and all spaces in between, seamless mobility means you can reach the people, things and information you need, anywhere, anytime. Seamless mobility harnesses the power of technology convergence and enables smarter, faster, cost-effective and flexible communication. Motorola had sales of US $31.3 billion in 2004. For more information: www.motorola.com.

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