IEEE P802.11
WPAN

Wireless Personal Area Network (WPAN) Five Criteria and 2.4GHz Coexistence Strategy

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Abstract

The following document was written during the January 14-15, 1998 meeting of the IEEE Wearables Standards Ad Hoc Committee in Memphis, TN USA. [I modified the language on April 23, 1998 to meet current Group Status] It is anticipated that this document will be edited futher during the Spring and Summer of 1998 in support of the Wireless Personal Area Network (WPAN) Study Group PAR effort.

The intent of this document is to address the five (5) Standards Development Requirements called out in the IEEE Project 802 document which defines the functional requirements and guidelines for the IEEE 802 family of Local Area Networks and Metropolitan Area Networks. Reference: Institute of Electrical and Electronics Engineers, Inc. Draft 6.8 Revised: July 10, 1991 (translated into HTML by Vic Hayes, January 1, 1997, update of Jan 13). As well as the secondary issue of analyzing the coexistence in the 2.4GHz band with current RF Transceivers i.e., 802.11 Standard FHSS and DSSS and Wireless Personal Area Networks (WPANs).

1. STANDARDS DEVELOPMENT CRITERIA

All projects authorized within the IEEE 802 family of LANs (including IVD LANs) and MANs shall meet the following five criteria.

1.1. Broad Market Potential

a) **Broad sets of applicability**

The increasing adoption of wearable and handheld computing and communicating devices, and the proliferation of peripheral devices for them, has made clear the need to provide wireless connectivity.

Examples of applications include Collaborative Maintenance, Mobile Worker, Medical Sensing, Data Synchronization, etc. Examples of devices, which can be networked, include Computers, PDA/HPCs, printers, microphones, speakers, bar code readers, sensors, displays, Pagers, and Cellular & PCS Phones.

The wireless capability will provide functionality, efficiency, productivity and, in some cases, safety of highly mobile workers using computing and communicating systems.

b) Multiple vendors and numerous users

The breadth of membership of this Wireless Personal Area Network (WPAN) Study Group demonstrates the support of this PAR. Members include international wireless industry leaders, academic researchers, semiconductor manufacturers, system integrators, and corporate end users. Individuals from more than 30 companies participated in drafting this PAR. The target user base will be large as indicated by the growing demand for PDAs, HPCs, Pagers, Cellular & PCS Phones, etc.

c) Balanced costs (LAN versus attached stations)

Wireless Personal Area Network (WPAN) connectivity costs will be a small percentage of the target devices e.g., PDA/HPCs, printers, microphones, speakers, bar code readers, sensors, displays, Pagers, and Cellular & PCS Phones.

1.2. Compatibility

IEEE 802 defines a family of standards. All standards shall be in conformance with IEEE 802.1 Architecture, Management and Interworking. All LLC and MAC standards shall be compatible with ISO 10039, MAC Service Definition1, at the LLC/MAC boundary. Within the LLC Working Group there shall be one LLC standard, including one or more LLC protocols with a common LLC/MAC interface. Within a MAC Working Group there shall be one MAC standard and one or more Physical Layer standards with a common MAC/Physical layer interface. Each standard in the IEEE 802 family of standards shall include a definition of managed objects, which are compatible with OSI systems management standards.

Note: This requirement is subject to final resolution of corrections and revision to current ISO 10039, currently inconsistent with ISO 8802 series standards.

The MAC (Medium Access Control) Layer of the Wireless Personal Area Network (WPAN) Standard will be compatible with the IEEE 802 requirements for architecture, management, and inter-networking.

1.3. Distinct Identity

a) Substantially different from other IEEE 802 standards.

The 802.11 Standard may not provide balanced cost for the WPAN class of devices listed above.
The 802.11 Standard does not address the power consumption envelope of the WPAN class of devices listed above.
The 802.11 Standard may not address the reduced complexity requirements for the WPAN class of devices listed above.
The 802.11 Standard optimizes for throughput, distance, and roaming whereas the WPAN optimizes for low cost and low power consumption in a small form factor.

b) One unique solution per problem (not two solutions to a problem).

The Wireless Personal Area Network (WPAN) Standard will consist of one Medium Access Control and Physical Layer. We are unaware of any existing standard that will address this class of devices.

c) Easy for the document reader to select the relevant specification.

The proposed Wireless Personal Area Network (WPAN) Standard will be a distinct document with clearly distinguishable specifications.

1.4. Technical Feasibility

a) Demonstrated system feasibility

There are several research activities that lead us to believe that the power management, network frequency management, and network management services objectives of WPANs are feasible. Unlike WLANs, WPANs have a greater ability to trade-off range and bandwidth and still meet the essential requirements.

b) Proven technology, reasonable testing

There are examples of technology that exist today.

c) Confidence in reliability

The air interface protocol will be designed to meet commercial reliability standards. The data from existing products and prototypes representing candidate approaches provide confidence in the reliability of the proposed solutions.

1.5. Economic Feasibility

a) Known cost factors, reliable data

Reduced performance requirements of WPANs will allow a substantially reduced cost of implementation over WLAN benchmarks. The use of 2.4 GHz in other high volume applications will provide a low cost source of components.

b) Reasonable cost for performance

Based on research results, prototype, and production solutions, implementation estimates meet requirements.

c) Consideration of installation costs

One of the WPAN standard objectives includes low cost installation with minimal operator intervention.

2. Strategy for WPAN Coexistence in the 2.4GHz band

We have identified WPAN coexistence with WLANs as a critical success factor.

Appendix

Wireless Personal Area Networking Study Group Document Archive

DOC No.	TITLE
-98/58	"Wearables" Standards Ad Hoc Committee Presentation to 802.11 Working Group (Robert Heile, GTE/BBN, and Ian Gifford, AMP M/A-Com), January 22, 1998
-98/94	"Wearables" Standards, Presentation to IEEE 802, ExCom (Dick Braley, Acting Chairman, "Wearables" Ad Hoc Standards Committee) , March 9, 1998
-98/95	**TUT 1 - "Wearables" Standards, Presentation to IEEE 802, Standards Committee (Dick Braley, Federal Express Corporation), March 9, 1998**
-98/96	**TUT 2 - A brief survey of Wearable applications (Steve Case, Via), March 9, 1998**
-98/97	**TUT 3 - Wireless Solutions (Pat Kinney, Intermec), March 9, 1998**
-98/98	**TUT 4 - PAN feasibility: The BodyLAN (TM) Experience (Rick LaRowe, GTE), March 9, 1998**
-98/135	Summary Report of the IEEE 802.11 WPAN Ad-Hoc Group Meeting held at Irvine, CA, March 9th - 13th, 1998
-98/136	Minutes of the IEEE 802.11 WPAN Ad-Hoc Group Meeting held at Irvine, CA, March 9th - 13th, 1998
-98/137	Venue for WPAN Ad-Hoc Group Meeting, April 8th - 9th, 1998, Cambridge, MA.
-98/147r1	WPAN Press Release Draft (Ian Gifford, M/A-COM)
-98/159	Minutes of the WPAN Study Group Meeting, Cambridge, MA 4/8-9/98 (Ian Gifford, M/A-COM)
-98/160r1	WPAN Guidelines (Ian Gifford, M/A-COM)
-98/161	Wireless Personal Area Network (WPAN) Five Criteria and 2.4GHz Coexistence Analysis (Ian Gifford, M/A-COM)
-98/162	First Draft PAR for WPAN (Rich Ditch, Motorola)
-98/163	Venue Hosted by GTE Internetworking (Ian Gifford, M/A-COM)
-98/169	WPAN SG Draft Agenda 5/4-7/98 Utrecht, NL
-98/170	WPAN SG Draft Agenda 5/19-21/98 Irving, TX USA
-98/171	Draft Glossary & Acronym List
-98/199	WPAN SG Call for Proposals for MAC/PHY (Bob Heile, Fedex)
-98/216	WPAN SG Application Summary (Pat Kinney, Intermec)
-98/217	HomeRF Overview Presentation (Stuart J. Kerry, Butterfly Communications)
-98/222	Summary Report of the IEEE 802.11 WPAN Study Group Meeting held at Utrecht, The Netherlands, May 4th - 8th, 1998 (Ian Gifford, M/A-COM)
-98/228r2	Minutes of the IEEE 802.11 WPAN Study Group Meeting held at Utrecht, The Netherlands, May 4th - 8th, 1998 (Ian Gifford, M/A-COM)
-98/229	Spectrum Availability Matrix (Pat Kinney, Intermec)
-98/233	Draft Liaison Letter (Ian Gifford, M/A-COM)
-98/235	Summary Report of the IEEE 802.11 WPAN Study Group Meeting held at Irving, TX, May 19th – 21st, 1998 (Ian Gifford, M/A-COM)
-98/236	Minutes of the IEEE 802.11 WPAN Study Group Meeting held at Irving, TX, May 19th – 21st, 1998 (Ian Gifford, M/A-COM)
-98/237	**CFP 1 - WPAN CFP – AMP Wireless Proposal (Bill Haymond, AMP)**
-98/238	**CFP 2 - WPAN CFP – GTE Internetworking Proposal (Rick LaRowe, GTE)**
-98/239	**CFP 3 - WPAN CFP – Intermec Technologies Proposal (Pat Kinney, Intermec)**
-98/240	Microwave Oven Overview (Bruce Kraemer, Harris)
-98/241	Is 802.11 the Answer? Topics for Discussion (Bob Heile, GTE)
-98/244	Preparing for PAR Review in LaJolla, CA (Bruce Kraemer, Harris)
-98/248	Study Group Report (Dick Braley, FedEx)
-98/249	2.4GHz Protocols i.e. MAC/PHY Layer Matrix (Bruce Kraemer, Harris)
-98/250	Frequently Asked Questions (Larry Ochs, Xetron)
-98/251	HomeRF Liaison Update #2 (Tim Blaney, Commcepts)
-98/252	Motorola Liaison Update #1 (Rich Ditch, Motorola)
-98/253	Bluetooth Liaison Update #1 (Simon Ellis, Intel)
-98/254	LaJolla ExCom Report (Ian Gifford, M/A-COM)
-98/255	LaJolla Agenda (Ian Gifford, M/A-COM)
-98/256	LaJolla Meeting Report (Ian Gifford, M/A-COM)

-98/257	Minutes of the IEEE 802.11 WPAN Study Group Meeting held at LaJolla, CA, July 6th – July 10th, 1998 (Ian Gifford, M/A-COM)
-98/249r1	Kraemer-WPAN RF Comparison Matrix (Revised with new data)
-98/288	WPAN Call for Applications, (S. Shell hammer, Symbol), July 1998
-98/290	WPAN -Agenda-Westford-Sep-98 (Updated original agenda with adopted agenda - a softcopy was provided at meeting)
-98/291r2	WPAN-SG-Minutes-Westford-Sep-98
-98/292	WPAN-SG-Meeting-Report-Westford-Sep-98 (presented on Friday)
-98/293	Summary-La Jolla MAC Layer Discussion (Revised at meeting), (B. Kraemer, Harris), September 1998
-98/294	**CFA 1 - Fedex CFA (D. Braley)**
-98/295	**CFA 2 - Symbol CFA (S. Shell hammer, Symbol), September 15, 1998**
-98/296	**CFA 3 - PED CFA (T. Blakadar)**
-98/297	**CFA 4 - TI CFA, (Chaya, TI)**
-98/298	Call For Applications Summary, (B. Kraemer, Harris), September 16, 1998
-98/299	HomeRF Liaison Update #3 Report (T. Blaney, COMMCEPTS), September 14, 1998
-98/300	Bluetooth Liaison Update #2 (S. Ellis) [note same as 7/98 LaJolla Liaison –98/253]
-98/301	McInnis-WPAN Applications Boeing
-98/322	MAC PICS vs WPAN requirements
-98/323	802.11 Terminology related to WPAN
-98/324	FH PHY PICS review (was informally presented, will be officially presented at next meeting)
-98/325	SPARE
-98/326	SPARE
-98/350	WPAN-Atlanta-Tentative-Minutes (Ian Gifford, M/A-COM)
-98/351	WPAN-Atlanta-Tentative-Report (Ian Gifford, M/A-COM)
-98/352	**CFA 5 – Kodak CFA (A. Heberling, Kodak) October 26, 1998**
-98/353	Comments on Impact of Bluetooth on 802.11 Direct Sequence -98/319 (J. Zyren, Harris)
-98/354	WPAN-Tentative-Agenda-Albuquerque-Nov98 (Ian Gifford, M/A-COM)
-98/356	WPAN-Albuquerque-Tentative-Minutes (Ian Gifford, M/A-COM)
-98/357	WPAN-Albuquerque-Tentative-Report (Ian Gifford, M/A-COM)
-98/358	WPAN-Albuquerque-Excom-Report (Dick Braley, FedEx)
-98/359	WPAN-Albuquerque-Liaison-Report (Ian Gifford, M/A-COM)
-98/360	TBD
-98/361	TBD
-98/362	TBD
-98/363	TBD
-98/364	TBD
-98/365	TBD