IEEE 802 Executive Committee Study Group on Broadband Wireless Access

Meeting Minutes and Study Group Final Report (Approved)

Hyatt Regency, Austin, Texas

9 to 11 March 1999

1. Tuesday, 9 March 1999

1.1. Opening

8:17 call to order by Roger Marks of meeting of IEEE 802 Executive Committee Study Group on Broadband Wireless Access (here abbreviated as 802.BWA).

1.2. Introductions and Attendance

Each person in the room introduced himself/herself by name and company. There were about 30 people in the room. The attendance book was circulated for all to sign.

The final attendance list for all who signed in at some time during the 3-day meeting is contained in Appendix A of these minutes.

1.3. Voting rights

For 802 working groups, attendance must be recorded and one must attend 75% of the meeting sessions.

For the 802.BWA study group, all attendees have voting rights.

1.4. Registration and Fees

You pay a fee for attending the conference. Payment is handled at the IEEE registration desk. Failure to pay causes loss of credit for voting rights and your name will be added to the deadbeat list.

1.5. Approval of Minutes from Orlando Meeting

Corrections to Orlando minutes:

Motion 1: by Brian Petry instead of Roger Marks.

Motion 6: seconded by Ray Sanders instead of blank

Spell Mollenauer correctly.

Motion 1, by Ray Sanders, 2nd by Karl Stambaugh, To approve the minutes with the above corrections.

Voice vote, unanimously approved.

1.6. Reports

Roger Marks presented summary of N-WEST history.

Current 802.BWA Leadership is:

- Chair, Roger Marks
- Secretary, Scott Marin
- Gene Robinson, Systems Task Group
- Leland Langston, Coexistence Task Group
- Jay Klein, Phy Task Group
- Jim Mollenauer, MAC Task Group

Roger presented a summary of 802.BWA Interoperability PAR titled: Standard for Broadband Wireless Access Systems.

Two editorial comments have been received from the 802 Executive Committee, which is reviewing the PAR. The word “interoperable” is not in the scope and should be. Roger will insert “interoperable” into the scope statement. The second comment asked for more information on “How is the standard distinct?”

The PAR was mailed to the 802 Executive Committee in time for approval consideration at the 802 Plenary meeting being held in conjunction with the current 802.BWA meeting.

Roger presented the PAR to the 802 Executive Committee on 3/8/99. Roger offered to visit and present a summary of 802.BWA at all 802 working groups. Three of the working group chairs have asked for foils.

The 802 Working Groups must get any comments to Roger by 5:00p on 3/9/99.

The 802.BWA Study Group has 24 hrs to revise the PAR and re-submit to the 802 Executive Committee.

On Thursday night (3/11/99), the 802 Executive Committee will vote on acceptance of 802.BWA Interoperability PAR and the establishment of the associated working group.

In anticipation of approval by the 802 Executive Committee, Jim Carlo, 802 Chairman, had also submitted the 802.BWA Interoperability PAR to the IEEE Standards Board, which meets the week of 3/15/99.

1.7. Objectives for Austin 802.BWA meeting

Roger discussed the following meeting objectives:

- Interoperability PAR approval.
- Write Coexistence PAR for submission to June 4 at 802 meeting.
- Narrow system scope.
- Plan interim meeting (Tentative, May 10-15, Boulder, CO, working meeting of Coexistence)
- Identify Volunteers for task group
- Decide on procedures.

1.8. 802 News

Jim Carlo, 802 Chairman, had the following remarks:

Jim encouraged all companies to consider hosting interim meetings. Jim clarified that July 1999 meeting, not the May 1999 interim meeting, should establish voting rights. Jim commented that the PAR is a key document and he wanted to see this group discuss the PAR and conduct a final vote of approval. Jim wanted the Executive Committee to know the final vote totals along with the number of companies involved.

Jim commented that someone should be designated to make a motion to approve the PAR at the Sponsor Executive Committee (SEC) of the LMSC (LAN/MAN Standards Committee, known as 802).

Jim encouraged the 802.BWA group to take a careful look at the PAR title. The title of PAR should differ from that of the working group. The PAR should be more specific than the working group.

Someone should also make a motion that the SEC charter a new working group and state the title of the working group. The title of the working group will stick for a long time. Jim suggested that “802.15” become the working group designator. (Note: On 9/10/99, Roger Marks noted that the WPAN Study Group prefers the designator “802.15” and that he had tentatively agreed to their request that 802.BWA accept “802.16”).

Jim clarified that the IEEE Computer Society sponsors the 802 group but that the IEEE MTT Society is also being asked to approve the BWA Working Group.

Jim commented again that if the PAR approval is not unanimous, then we should bring all objections to the SEC.

If the 802 SEC approves the PAR, the 802 SEC will forward the PAR to NESCOM for approval.

1.9. Discussion on Coordination with the ITU

Several attendees pointed out that the International Telecommunications Union, ITU, is a key organization with which to coordinate. 802.BWA may need to coordinate with both the telecommunication sector, ITU-T and radio communications sector. Several 802.BWA members are active in various ITU-R groups.

1.10. Potential Future meetings.

Roger presented the following possibilities:

- May 10-14, Boulder, C) for an interim meeting
- July 5-9 Queen Elizabeth, Montreal, Quebec with 802
- Nov 8-12 Hyatt Regency Kauai, Koloa, HI. with 802
- Aug 5-6, Denver in conjunction with RAWCON for an interim meeting

No decision was made to commit to any of the above dates.

1.11. On the Importance of Contributions

Roger commented:

It's important to get work done between meeting. The 802.BWA group didn't make enough progress since the Orlando meeting.

Contributions are the only way to make things stick. The 802.BWA group needs rules for submission of contributions.

The call for contributions is very important. The contributors must tell the group what they want done with each contribution.

1.12. Web and Document Security Discussion

Security and passwords was discussed with several views on whether to be totally open or very restrictive.

Jim Carlo pointed out that all sessions are public and that draft standards are copyrighted by IEEE.

Most 802.BWA presentations have been recorded and placed on the web in streaming audio.

The group agreed to delay votes on web/document security until a session on procedures (Thursday).

Documentation at 802.11 meetings is normally distributed by PCMCIA flash EPROM or wireless LAN. 802.BWA contributions for the Austin meeting are on the 802.BWA web site (http://nwest.nist.gov). Limited hardcopies are normally available upon request but everyone should move to electronic copies. Don't be timid about asking for 802 services.

1.13. Discussion on Positions to be filled

The following position will need to be filled:

- Chair: filled by 802 EXCOM
- Vice Chair/ Parliamentarian
- Secretary
- Task Group leaders

10:15 break, 10:40 call to order by Roger Marks

Second round of introductions by those not present earlier.

1.14. Contributions for review at the 802.BWA Austin Meeting

Task Group	Doc #	Lead Author	Date	Document Title
Coexistence	c1	Langston	3-Mar-99	Summary of Task Group Comments
	c2	Marin	2-Mar-99	Recommended LMDS Bandplan for Systems in the United States
	c3	Marin	6-Mar-99	Interference Considerations at LMDS/LMCS License Boundaries
	c4	Marin	6-Mar-99	Preliminary Draft Revision of ITU-R Recommendation F.1191, "Bandwidth and Unwanted Emission of Digital Radio-Relay Systems"
	c5	Doucet	2-Mar-99	Proposed Spectrum Plan for Multimedia Wireless Systems (MWS) for the European Market
	c6	Rahman	2-Mar-99	LMDS BandPlan Proposal
	c7	Bromberg	18-Feb-99	Comments on spectrum etiquette elements to be covered in the proposed standard
Systems	s1	Mollenauer	5-Mar-99	Functional Requirements for Broadband Wireless Access Networks
	s2	Robinson	6-Mar-99	Communications Network with Layered Architectures
	s3	Robinson	6-Mar-99	Proposed Standard Document Outline for the Physical Layer of the Broadband Wireless Access Radio Path
	s4	Cant	28-Jan-99	Scope of standard
	s5	Klein	?1998	ETSI TR101 177, v.1.1.1 Broadband Radio Access Networks (BRAN) Requirements and architectures for broadband fixed radio access networks (Hiperaccess)
	s6	Klein	1998-05	ETSI TR 101 173 V1.1.1 (1998-05) Broadband Radio Access Networks (BRAN) Inventory of broadband radio technologies and techniques

The ETSI documents are freely available at (http://www.etsi.org) but due to ETSI's copyrights the documents will not be redistributed by 802.BWA.

The above documents, except the ETSI documents, are available on the web page (http://nwest.nist.gov) and were also distributed by floppy disk during the meeting.

1.15. Presentation of Contributions

System Requirements Documents:

- Gene Robinson presented document s3.
- Jay Klein presented document s5.
- Gene Robinson presented document s4 and s2.

12:30 break for lunch, 13:40 call to order, continuation of systems document presentation

- Jim Mollenauer presented document s1.
- Jay Klein presented document s7.

Coexistence Documents:

- Leland Langston presented document c1

15:18, Break, 15:55 call to order, continuation of Coexistence document presentation

- Scott Marin presented documents c2, c3, and c4.
- Leland Langston presented document c6 and c5.

1.16. Wrap up for 1st day

Roger summarized:

- Tomorrow 8:00am start. Objective: to finalize the Coexistence PAR.
- Come in with specific suggestions to any PAR changes.

17:05 adjourn

2. Wednesday, 10 March, 1999

8:20 call to order by Roger Marks

2.1. Finalization of Interoperability PAR

Roger stated that comments received include:

- Comment 1, address ETSI BRAN differences.
- Comment 2, use the word "interoperability" in scope.
- Comment 3, make the PAR title more specific to a project of the working group

Discussion about scope (air interface, Phy, MAC, IF, MMDS)

Motion 2, by Gene Robinson , 2nd by Ray Sanders, to change the first sentence of the scope

From:

[This standard includes specifications for the air interface, including the physical layer and media access control layer, of fixed point-to-multipoint broadband wireless access systems providing multiple services operating in the vicinity of 30 GHz. These specifications will be broadly applicable to systems operating between 10 and 66 GHz.]

To:

This standard specifies the physical layer and media access control layer of the air interface of an interoperable fixed point-to-multipoint broadband wireless access systems providing multiple services operating in the vicinity of 30 GHz. These specifications will be broadly applicable to systems operating between 10 and 66 GHz.

34/1/3[1] Motion 2 passes

Continued discussion on the scope

Motion 3, by Jim Mollenauer, 2nd by Ray Sanders to change scope to:

This standard specifies the physical layer and media access control layer of the air interface of inter-operable fixed point-to-multipoint broadband wireless access systems operating in the vicinity of 30 GHz. The specification will enable transport of data, video, and voice services and will be broadly applicable to systems operating between 10 and 66 GHz.

34/0/4 Motion 3 passes.

Motion 4, by Howard Sandler, 2nd by Dave Palmer , to replace the phrase "data, video, and voice" with "services, such as data, video, and voice".

4/25/6 Motion 4 fails.

Motion 5, by Ray Sanders, 2nd by George Harter, to change lower bound from 10 GHz to 2 GHz

Motion 5, withdrawn.

Motion 6, by Jim Mollenauer, 2nd by Leland Langston, to accept scope as:

[1] Show of hands vote for/against/abstain.

This standard specifies the physical layer and media access control layer of the air interface of inter-operable fixed point-to-multipoint broadband wireless access systems. The specification enables transport of data, video, and voice services. It applies to systems operating in the vicinity of 30 GHz but is broadly applicable to systems operating between 10 and 66 GHz.

37/0/2 Motion 6 passes

Motion 7, Leland, 2nd Jim Mollenauer to accept Title:

From: Standard for Broadband Wireless Access Systems

To: Air Interface for Fixed Broadband Wireless Access Systems

36/0/2 Motion 7 passes.

10:06 discussion about why the ETSI BRAN work is not valid for adoption.

Motion 8: by John Liebetreu, 2nd by Ray Sanders to adopt wording:

This is a regional standards effort that does not allow full participation by the rest of the world. Furthermore, the project addresses regional markets with specific regulatory conditions distinct from those of other areas. We have held a joint meeting with this group and appointed a liaison. We plan to coordinate with them and will seek harmony where possible.

Motion 8, unanimous with 4 abstentions, motion passes

10:25 break, 10:50 call to order by Roger Marks.

Ray Sanders acting secretary while Scott Marin is temporarily absent.

Roger suggests that group review all items of the PAR and bring up any amendments they deem advisable. He then shows the various sections of the PAR for comment.

Roger reviews specifically the patent section involving individual companies and asks for additions. Ray Sanders adds CircuitPath Network Systems Corp. Wytec was also added.

Roger reviews the section on coordination with other standards organizations. There was a discussion of ITU-R, which had been included previously. It was suggested that the ITU-R Joint Rapporteurs Group 8A-9B Wireless Access Systems (WAS) is an appropriate ITU-R group to coordinate with.

Roger suggests that the PAR be accepted as written on his machine and that a motion be made to that effect. A second motion he suggests is to vote to submit the PAR to the IEEE Executive Committee.

Motion 9, by Leland Langston, 2nd by John Liebetreu, to accept the PAR as written on Roger Marks' computer.

32/0/4 Motion 9 passes

Jerry Woodard suggests that the PAR should not be submitted[2]. The BWA industry is not yet mature enough to submit a standard, and standards created too quickly will be a detriment to the industry. He further suggests that the group focus on coexistence and not on other aspects of the PAR as written.

Motion 10, by Jerry Woodard, 2nd by Robert Foster, It is moved that the PAR as voted in Motion 9 be tabled and not submitted to the IEEE Executive Committee. It is further moved that the PAR be tabled for a period of one year.

Discussion:

Jerry Woodard feels strongly that the group should focus on coexistence and RF compatibility as a first priority and not standardize on something that currently exists that does not meet the real customer need.

Someone supports the prior comments.

Someone suggests that very few proprietary standards are going to be accepted on a worldwide basis. However, the standards process should proceed and proprietary standards will be adapted to the overall standard as time goes on.

[2] The following detail discussion is entered into the minutes at the request of Jim Carlo, 802 Chairman.

Paul Khanna opposed the motion.

Someone discussed the standards process that came about within 802.14 (Cable Modems) and the emergency of DOCSIS by a group of industry participants independent of 802.14. If 802.BWA standard is not produced in a timely manner, the same disruptive industry behavior could well be repeated.

Someone suggests that a coexistence plan be the first priority for the 802.16 group and that can be followed by successive generations of other standards. He further suggests that, except for the coexistence portion of the PAR, 2001 may be too early for a complete standard. However, the standards process should proceed since, without standards, the industry could flounder.

Someone points out that, without the PAR being approved, we do not have a working group. Further, it has been agreed that coexistence be the priority for a PAR submission in July 1999. None of the work can be started without submitting the PAR. Individual PARs can be submitted independent of one another. It is not necessary that all the standards work be completed prior to submission.

Leland Langston says that coexistence has been discussed extensively and that so far, there are not enough submissions, particularly from those who have serious coexistence issues.

Someone states that coexistence should be only a part of the effort. Roger notes that there is no way that a coexistence PAR alone would be approved independent of the air interface.

Someone wants clarification of how long the air-interface PAR should remain tabled. Jerry wants to ensure that no air interface standard be drawn until the market is ready with delivered equipment.

Someone believes that there is a lot of useful work that can be done by working groups without actually producing a standard.

Someone comments that continued work on a standard is essential.

Someone suggests that a standard will never happen unless the process proceeds.

Roger suggests that some may perceive that the standards process will slow the industry by giving operators reason to not deploy systems prior to the release of a standard. Coexistence can proceed without this worry, and it is essential that the group proceed on that. This should ensure that current deployments do not preclude future deployment of standard systems.

3/29/6 Motion 10 fails, The three votes for the motion came from Jerry Woodard of Wytec, Margaret Ralston of Wytec, and Robert Foster of Wavtrave.

Motion 11 by _____, 2nd by _____, That the previously approved PAR be submitted to the IEEE for approval.

27/3/6 Motion 11, passes.

11:58 Recessed for lunch, 13:24 call to order by Roger Marks

Scott Marin returns as Secretary.

Roger reported that the revised Interoperability PAR (Appendix B) was submitted to 802 SEC during the lunch break, and that the submission meets the 5:00p deadline of today. The previously submitted five criteria are contained in Appendix C

2.2. Discussion: Coexistence PAR

Presentation by Doron Koren

Discussion on time-division-duplex (TDD) versus frequency division duplex (FDD).

Karl Stambaugh suggested to split the meeting into a Coexistence Task Group and Systems Task Group.

6 people showed interest in coexistence, 11 people showed interest in system requirements.

Strawpole: “who’s in favor of spitting?”, 19 for, 7 against.

2.3. Joint Meeting suspended and split into Task Groups

14:00 Split off Systems Task Group chaired by Gene Robinson and Coexistence Task Group chaired by Leland Langston, to return to a joint session by 16:30.

2.4. Joint Meeting Reconvened

16:58 Roger Marks reconvened joint session.

Leland reported on draft scope and draft purpose of Coexistence PAR.

Gene reported on result of Systems Task Group, which made good progress on system requirements document outline.

2.5. Wrap up for 2nd day

Issues for Thursday:

- actions for next meeting
- task groups
- call for contributions
- organize inputs
- web+mailing list
- who has access
- under what conditions can documents be accessed.
- The morning session will be split into the Coexistence and Systems Task Groups

17:35 adjourn

3. Thursday, 11 March, 1999

The Coexistence and Systems Task Groups met separately during the morning.

3.1. Joint Meeting Reconvened

13:03 call to order by Roger Marks

3.2. 802.15 versus 802.16

802.15 has been requested by WPAN. 802.16 is the alternative. No concerns expressed.

3.3. Request for Contributions

Roger to refine the request for contributions.

3.4. Next Meeting Discussion

Suggestion for next meeting 10-12 or 17-19 May, Boulder, Colorado.

Strawpole: Who prefers 1st week?, 3 , Who prefers 2nd week, 3

3.5. 802.BWA voting suspended

The 802.BWA study group expires today. Votes are non-binding.

3.6. Report by the Coexistence Task Group

Leland Langston presented summary of Coexistence Task Group activities. Leland to summarize in e-mail to Roger (Appendix D).

Call for contributions to be out by end of next week.

At next meeting, plan to finalize the coexistence PAR and produce a clear outline of scope.

3.7. Report by the Systems Task Group

Gene Robinson presented summary of System Requirements Task Group activities (Appendix E).

Brian Petry volunteered as editor of System Requirements Document.

Gene pushed to maintain a structured process to continue to flush out the system requirements outline. Brian Petry and others pushed to begin drafting the documents.

Strawpole: Should the chair of a hypothetical working group appoint an editor to bring a draft system functional requirements to the May meeting? 18 for, 0 against, 4 abstain

Strawpole: Should everyone be copied on submissions to editor? All for.

3.8. Discussion of e-mail list, Document access, Templates, and Press Releases

Roger Marks stated that the e-mail list will include attendees from each meeting.

Discussion on document access (public, private). Much debate. Get guidance from 802 SEC.

Scott Marin to put out Word, Excel, and PowerPoint templates for submissions.

Strawpole: That we accept and trust Roger to put out press releases that Roger deems necessary until next meeting. 11/3/4 passes.

3.9. Tentative schedule for future meetings

1999

- May 10-12 – Boulder, CO
- July 5-9 - Queen Elizabeth, Montreal, PQ
- Aug. 5-6 - Denver, CO, Interim
- November 8-12 - Hyatt Regency, Kauai, Koloa, HI, Plenary

2000

- March 6-10 - Hyatt Regency, Albuquerque, NM, Plenary
- July 10-14 - Hyatt Regency La Jolla, San Diego, CA, Plenary
- November 6-10 - Hyatt Regency, Tampa, FL, Plenary

3.10. Adjourn Austin meeting

Motion 12, by Leland Langston, 2nd by Mike Stewart, to adjourn,

Motion 12, all for, motion passes.

Respectfully,

Scott Marin

Secretary, 802.BWA

Appendix A: Attendance List, Austin Meeting of 802.BWA (9-11 March 1999)

Arun Arunachalam	Nortel Networks
Hanno Beisinghoff	Siemens Microelectronics, Inc.
Luc Boucher	Industry Canada
Keith Bromberg	WaveSpan Corporation
Steve Brozovich	Filtronic Solic State
David Bryant	3Com Corp.
Jim Carlo	Texas Instruments
Rémi Chayer	Harris Corporation
Greg Copeland	IDT Inc.
Peter Ecclesine	Cisco Systems, Inc.
Jeff Foerster	Stanford Wireless Broadband Inc.
Robert Foster	Wavtrace, Inc.
Hamid Gharavi	NIST
Martin Grace	Anritsu Company
Steven Gray	Nokia Research Center
Rami Hadar	Ensemble Communications
George Harter	Hardin & Associates, Inc.
Hossein Izadpanah	HRL Laboratories
Vladan Jevremovic	U S WEST Advanced Technologies
Ronald Kemper, Sr.	PSW Technologies
Amarpal Khanna	Hewlett-Packard Company
Jay Klein	Ensemble Communications
Tom Kolze	ComStar Communications
Rajeev Koodli	Nokia Research Center
Doron Koren	TelesciCOM Ltd.
Ignatius Lam	Nortel Networks
J. Leland Langston	Raytheon Systems Company
John Liebetreu	SiCOM, Inc.
Fred Lucas	3Com Corp.
J. Scott Marin	Bosch Telecom, Inc.
Roger B. Marks	NIST
Sanjay Moghe	ADC Telecommunications
James F. Mollenauer	Technical Strategy Associates
Louis Olsen	Teligent
David Palmer	Philips Broadband Networks
Vakis Papaparaskeva	Stanford Wireless Broadband Inc.
Brian Petry	3Com Corp.
Margarete Ralston	Wytec Incorporated
Moshe Ran	TelesciCOM Ltd.
Stanley Reible	MICRILOR, Inc.
Gene Robinson	E. A. Robinson Consulting, Inc./Angel Technologies
Clemens C.W. Ruppel	Siemens AG
Ray W. Sanders	CircuitPath Network Systems
Howard Sandler	Nortel Networks
David Schafer	Wavtrace, Inc.
Chet Shirali	Phasecom Inc.
Karl Stambaugh	Motorola Inc.
Michael Stewart	Escape Communications
Paul Struhsaker	World Access Inc.
Roland Svensson	Wavtrace, Inc.
Polychronis Tzerefos	University of Sheffield
Brent Weingardt	Personal Communications Industry Association
Jerry Woodard	Wytec Incorporated
Jung Yee	Newbridge Networks Corporation

Appendix B: Interoperability PAR, As Approved

IEEE-SA Standards Board Project Authorization Request (PAR) Form

1. Sponsor Date of Request 1999 Mar 11	2. Assigned Project Number P802.16	3. PAR Approval Date 1999 Mar 18

4. Project Title, Recorder and Working Group/Sponsor for this Project

Document type and title:

- [**x**] **Standard for**{document stressing the verb "shall"}
- [ ] **Recommended Practice for**{document stressing the verb "should"}
- [ ] **Guide for** {document in which good practices are suggested}

Title: Telecommunications and Information Exchange Between Systems - LAN/MANSpecific Requirements - Air Interface for Fixed Broadband Wireless Access Systems

Name of Working Group:			**IEEE P802.16: Broadband Wireless Access**
Name of Official Reporter (usually the W.G. Chair) who must be IEEE/Affiliate AND Standards Association (SA) members.			**Roger B. Marks**
Title in WG:	**Chair**	IEEE/Affiliate Member #	[ ]
Company:	**National Institute of Standards and Technology**	Telephone:	**303-497-3037**
Address:	**325 Broadway, MC 813.00**	FAX:	**303-497-7828**
City/State/Zip:	**Boulder, CO 80303**	Email:	**r.b.marks@ieee.org**

Name of Sponsoring Society and Committee:		**Computer Society, LAN/MAN Standards Committee; Microwave Theory and Techniques Society**	
Name of Committee Sponsor Chair:		**Jim Carlo, LAN/MAN Standards Committee**	
		IEEE/Affiliate Member #	**[ ]**
Company:	**Texas Instruments**	Telephone:	**[ ]**
Address:	**9208 Heatherdale Drive**	FAX:	**[ ]**
City/State/ Zip:	**Dallas, TX 75243-6332**	Email:	**jcarlo@ti.com**

5. Describe This Project; *Answer each of four questions below:*

a. Update an existing PAR **No**
b. Choose one from the following:
   - [**x**] New Standard
   - [ ] Revision of existing standard[ ]
   - [ ] Supplement to existing standard[ ]
c. Choose one from the following:
   - [**x**] Full Use (5-year life cycle)

- [ ] Trial Use (2-year life cycle)

d. Fill in Target Completion Date to IEEE RevCom : **2001 Jan 31**

6. Scope of Proposed Project:

This standard specifies the physical layer and media access control layer of the air interface of interoperable fixed point-to-multipoint broadband wireless access systems. The specification enables transport of data, video, and voices ervices. It applies to systems operating in the vicinity of 30 GHz but is broadly applicable to systems operating between 10 and 66 GHz.

7. Purpose of Proposed Project:

To enable rapid worldwide deployment of innovative, cost-effective, and interoperable multivendor broadband wireless access products. To facilitate competition in broadband access by providing alternatives to wireline broadband access. To facilitate coexistence studies, encourage consistent worldwide allocation, and accelerate the commercialization of broadband wireless access spectrum.

8. Intellectual Property

a. Are you aware of any patents relevant to this project?
[**Yes**] {Yes, with detailed explanation below / No}

Companies that may hold relevant patents (issued or pending) include:

- AMP Inc.
- Cellularvision Technology & Telecommunications, L.P.*
- CircuitPath Network Systems Corp.
- Ensemble Communications, Inc.
- Harris Corp.
- Hughes Network Systems*
- Netro Corp.
- Nortel Networks
- Philips Electronics
- Raytheon Systems Company
- Stanford Telecom, Inc.
- Texas Instruments*
- WavTrace, Inc.
- Wytec Inc.

***not participating in Study Group at time of PAR submission**

b. Are you aware of any copyrights relevant to this project?
[**No**]

c. Are you aware of any trademarks relevant to this project?
[**No**]

9. Are you aware of any other standards or projects with a similar scope?

[**Yes**] {Yes, with detailed explanation below / No}
The Broadband Radio Access Networks (BRAN) Committee of the European Telecommunications Standards Institute (ETSI) has a project known as HIPERACCESS which is in the early stages of an attempt to standardize broadband wireless access in Europe. This is a regional standards effort with limited participation by the rest of the world. Furthermore, the project addresses regional markets with specific regulatory conditions distinct from those of other areas. We have held a joint meeting with this group and appointed a liaison. We plan to coordinate with them and will seek harmony where possible.

10. International Harmonization

Is this standard planned for adoption by another international organization?
[**Yes**]
If Yes: Which International Organization [**ITU-R**]
If Yes: Include coordination in question 13 below

11. Is this project intended to focus on health, safety or environmental issues?

[**No**]

12. Proposed Coordination/Recommended Method of Coordination

Mandatory Coordination		
SCC 10 (IEEE Dictionary)		by **DR** {Circulation of **DR**afts}
IEEE Staff Editorial Review by		by **DR**
SCC 14 (Quantities, Units and Letter symbols)		by **DR**
Coordination requested by Sponsor:		
[**ITU-R, including Joint Working Group 8A/9B (Wireless Access Systems)**]	by [**LI**]	{Circulation of **DR**afts/**LI**aison memb/**CO**mmon memb}
[**ETSI BRAN**]	by [**LI**]	{Circulation of **DR**afts/**LI**aison memb/**CO**mmon memb}

Additional Explanation Notes:

This standard will rely on the results of a related standard defining principles by which broadband wireless access systems can coexist in areas of adjacent or overlapping geography or spectrum. A PAR outlining this "coexistence" standard is in preparation by the IEEE 802.16 Working Group on Broadband Wireless Access for consideration at the July 5-9, 1999 802 Executive Committee meetings.

Note: As required by the LAN/MAN Standards Committee, documentation of how of the project will address the Five Criteria for Standards Development is attached.

Appendix C: Interoperability PAR, Five Criteria

Rationale for a Broadband Wireless Access Air Interface Standard: Meeting the Five Criteria

1. Broad Market Potential

A standards project authorized by IEEE 802 shall have a broad market potential. Specifically, it shall have the potential for:

a) Broad sets of applicability

Access networks in the millimeter-wave region are a rapidly emerging technology on a worldwide basis. Such networks have the potential to compete with copper- and fiber-based systems in terms of capacity, and they offer the advantage of not requiring the installation of buried or pole-based infrastructure. This is particularly advantageous in countries where the infrastructure is not widely deployed. In the US, the recent auction of the LMDS frequency bands testifies to the level of interest in providing communication facilities based on broadband wireless. Similar allocation of frequencies in the millimeter region (above 10 GHz) is occurring in many other countries.

b) Multiple vendors and numerous users

The interest of many vendors is attested by the membership of the 802 Executive Committee Study Group on Broadband Wireless Access. Each of the 97 members, representing over 70 companies, participating in at least one of the Study Groups' two meetings (see Appendix A). NIST's N-WEST initiative, which aims for standardization in broadband wireless access, currently includes 58 supporting companies, 7 of which have enrolled since the January meeting. Two of the Supporting Companies are wireless trade associations representing many more (see Appendix B).
Although broadband wireless access networks have only recently been deployed, many users are already on-line using proprietary systems. For example, one service provider in the US currently has facilities operating in over 40 cities.

c) Balanced costs (LAN versus attached stations)

Given that a base station in a point-to-multipoint network can serve many user stations, and a single user station can serve many users in the building, the cost of the equipment can easily be spread over many users. Typically it will represent a small fraction of the total investment in computing and telecommunications hardware.

2) Compatibility

IEEE 802 defines a family of standards. All Standards shall be in conformance with the IEEE 802.1 Architecture, Management and Interworking documents as follows: 802 Overview and Architecture, 802.1D, 802.1Q and parts of 802.1f. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with 802.
Each standard in the IEEE 802 family of standards shall include a definition of managed objects which are compatible with systems management standards.
The proposed standard will conform to the 802 Functional Requirements Document, with the possible exception of the Hamming distance.

3. Distinct Identity

Each 802 standard shall have a distinct identity. To achieve this, each authorized project shall be:

a) Substantially different from other IEEE 802 standards.

The BWA standard occupies a distinct place in the family of standards. It is intended to provide for public access networks operated by a third party, where the user typically makes use of a wide-area network through an access network. It differs also from a wireless LAN, which typically is operated by a single organization over smaller distances and has less-stringent requirements for system integrity and resistance to unauthorized usage.
The access network is optimized for distances comparable with the propagation of millimeter waves through the atmosphere, which typically limits the distance between base stations and users to metropolitan dimensions.

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

It is envisioned that the standard will provide protocols sufficiently flexible to provide efficiently for a variety of services, some of which may have stringently bounded delay requirements. Hence it will not be necessary to have a multiplicity of different and incompatible versions.

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

It is anticipated that the document will be easily understandable for any reader attending the third and later IEEE 802 meetings, so long as one of those meetings is a plenary session.

4) Technical feasibility

For a project to be authorized, it shall be able to show its technical feasibility. At a minimum, the proposed project shall show:

a) Demonstrated system feasibility

The feasibility of such systems has been demonstrated by proprietary systems covering some if not all of the capabilities intended for this standard and now going into operation in many cities worldwide.

b) Proven technology, reasonable testing

The radio technology in millimeter-wave systems has been demonstrated for many years in both point-to-point and point-to-multipoint systems, as used in commercial and military environments. Many systems are now in commercial use.

c) Confidence in reliability

Commercial deployment of point-to-point and point-to-multipoint systems at millimeter-wave frequencies by carriers is evidence of proven reliability.

5) Economic feasibility

a) Known cost factors, reliable data

The economic feasibility of the equipment has already been demonstrated at the level of proprietary systems now going into operation. The willingness of investors to spend large sums to acquire spectrum rights, plus the large additional investment required for hardware in public networks, attests to the economic viability of the wireless access industry as a whole.

b) Reasonable cost for performance.

The use of such methods as point-to-multipoint communication provides substantial economies relative to earlier point-to-point technologies, particularly in handling data, which is characterized by high peak demands but bursty requirements overall. As demonstrated in many IEEE 802 standards over the years, such shared-media systems effectively serve users whose requirements vary over time, within the constraints of the total available rate. The cost of a single base station is amortized over a large number of users.

c) Consideration of installation costs.

Installation of any wireless customer-site system is relatively simple in that no offsite cabling need be installed. In contrast, with wireline networks the plant expense to connect the customer to the network is a very substantial part of the total cost and must be incurred for the first user in a coverage area. With wireless, the expenses can be incurred as customers come on-line. The siting of base stations is a more complex issue, but since one base station supports many users, the costs involved are very nominal on a per-user basis.

Rationale for a Broadband Wireless Access Air Interface Standard: Meeting the Five Criteria

Appendix A: Members of the 802 Executive Committee Study Group on Broadband Wireless Access (November 12, 1998 - March 11, 1999)

The 97 Members of the 802 Executive Committee Study Group on Broadband Wireless Access, each of whom attended either [1] the January 13-15, 1999 meeting in Orlando, or [2] the March 9-11, 1999 meeting in Austin. Over 70 companies are represented.

- 3Com
  - David Bryant [2]
  - Scott A. Lery [1]
  - Fred Lucas [2]
  - Brian Petry [1,2]
- Alcatel USA
  - Francois Vigneron [1]
- ADC Telecommunications
  - Sanjay Moghe [2]
- AMP, Inc.
  - Zev Bogan [1]
  - George Fishel [1]
  - Roy J. Hebert [1]
- Andrew Corporation
  - Mike Wolfe [1]
- Angel Technologies Corp.
  - Nicholas Colella [1]
- Anritsu Company
  - Martin Grace [2]
- AT&T
  - Cherry Tom [1]
- Belstar Systems Corp.
  - Jack Van der Star [1]
- BNA Systems
  - Reza Ahy [1]
- Bosch Telecom, Inc.
  - J. Scott Marin [1,2]
  - William Myers [1]
- BreezeCOM
  - Marianna Goldhammer [1]
- Broadband Ventures
  - David J. Mallof [1]
- C&W Systems, Ltd.
  - Narisa Chu [1]
- California Amplifier, Inc.
  - Kris Kelkar [1]
- CircuitPath Network Systems
  - Ray W. Sanders [1,2]
- Cisco Systems, Inc.
  - Peter Ecclesine [2]
- ComStar Communications
  - Tom Kolze [1,2]
- Dot.Wireless
  - George Eisler [1]
- E. A. Robinson Consulting, Inc.
  - Gene Robinson [1,2]
- Ensemble Communications
  - Rami Hadar [1,2]
  - Jay Klein [1,2]
- Ericsson Inc.
  - Peter Nohren [1]
  - Asif Rahman [1]

Escape Communications
- Michael Stewart [2]

Eurobell
- Gary Debeger [1]

Filtronic Solid State
- Steve Brozovich [1,2]

Hardin & Associates, Inc.
- George Harter [2]

Harris Corporation
- Remi Chayer [1,2]
- Al Petrick [1]
- John Tremblay [1]

Hewlett-Packard Company
- Paul Khanna [1,2]

HRL Laboratories
- Hossein Izadpanah [1,2]

IDT Inc.
- Greg Copeland [2]

Industry Canada
- Luc Boucher [1,2]
- Douglas Sward [1]

Integrity Communications
- Erol Yurtkuran [1]

Kyocera DDI Institute
- Tatsuaki Hamai [1]

LCC International Inc.
- Larry Watkins [1]

Logimetrics, Inc.
- Frank Brand [1]

Lucent Technologies
- Douglas A. Gray
- Adrian Hartman [1]

MICRILOR, Inc.
- Stanley Reible [2]

Millitech Corporation
- Wayne Pleasant [1]

MMAC
- Masaaki Mitani [1]

Motorola Inc.
- Karl Stambaugh [1,2]
- Takehiko Tsutsumi [1]

Netro Corpopration
- Allan Evans [1]

Newbridge Networks Corp.
- Jung Yee [1,2]

NIST
- Hamid Gharavi
- Roger B. Marks [1,2]

Nokia Research Center
- Steven Gray [2]
- Rajeev Koodli [2]

Nortel Networks
- Hongming An[1]
- Arun Arunachalam [2]
- Jose M. Costa[1]
- Ignatius Lam [1,2]
- Howard Sandler [2]

NTT Electronics Corp. (NEL)
- Paul Chang [1]

Personal Communications Industry Asociation
- Brent Weingardt [2]

Phasecom Inc.
- Chet Shirali [2]

Philips Broadband Networks
- David Palmer [1,2]
- Erik Schylander [1]

PSW Technologies
- Ronald Kemper, Sr. [2]

Raytheon Systems Company
- J. Leland Langston [1,2]

SiCOM, Inc.
- John Liebetreu [1,2]

Siemens AG
- Clemens C.W. Ruppel [2]

Siemens Information and Communication Networks
- Larry Bowers [1]

Siemens Microelectronics, Inc.
- Hanno Beisinghoff [2]

Stanford Wireless Broadband Inc.
- Steven Farrell [1]
- Jeff Foerster [2]
- Tom Magill [1]
- Vakis Papaparaskeva [2]

Technical Strategy Associates
- James F. Mollenauer [1,2]

Telegen Ltd.
- Christopher Cant [1]

Teligent
- Louis Olsen [2]

TelesciCOM Ltd.
- Doron Koren [2]
- Moshe Ran [2]

Texas Instruments
- Jim Carlo [2]

TRW
- Chris S. Brown [1]

University of Sheffield
- Polychronis Tzerefos [2]

U S WEST Advanced Technologies
- Vladan Jevremovic [2]

WaveSpan Corporation
- Keith Bromberg [1,2]

Wavtrace, Inc.
- Robert Foster [2]
- David Schafer [1,2]
- Roland Svensson [1,2]

World Access Inc.
- Paul Struhsaker [2]

WinStar Network Services
- Sherman Ackley [1]

Wireless Communications Association Intl.
- Andrew T. Kreig [1]

Wytec Incorporated
- Margarite Ralston [2]
- Jerry Woodard [2]

Rationale for a Broadband Wireless Access Air Interface Standard: Meeting the Five Criteria

Appendix B: N-WEST Supporting Companies (updated March 11, 1999)

1. 3Com Corporation
2. ADC Telecommunications
3. AMP M/A-COM
4. Alcatel Network Systems
5. Andrew Corporation
6. Anritsu Company
7. Antilles Wireless Cable TV Co.
8. Bellcore
9. Belstar Systems Corp.
10. BroadBand Wireless Inc.
11. C&W Systems, Ltd.
12. Cable AML Inc.
13. Cellular Telecommunications Industry Association
14. Charles Brinkman
15. CircuitPath Network Systems
16. E B Systems Limited
17. EDX Engineering, Inc.
18. EER Systems
19. ETM Electromatic
20. Ensemble Communications
21. Ericsson Inc.
22. Formus Communications, Inc.
23. Fujitsu Compound Semiconductor, Inc.
24. Hardin & Associates, Inc.
25. Harris Corp.
26. Hewlett-Packard Co.
27. I DT Inc.
28. Illinois Institute of Technology
29. In tegrity Communications
30. Intraplex
31. Istari Design, Inc.
32. LCC International Inc.
33. Lucent Technologies
34. MLJ, Inc.
35. Millitech Corporation
36. Motorola Inc.
37. NEC America, Inc.
38. Netro Corporation
39. Newbridge Networks Corporation
40. Nortel
41. Philips Broadband Networks
42. P-COM
43. Raychem Corp.
44. Raytheon Systems Company
45. Run.com Communications Ltd.
46. Sanders, A Lockheed Martin Co.
47. SiCOM, Inc.
48. Siemens Microelectronics, Inc.
49. Spike Technologies, Inc.
50. Stanford Wireless Broadband Inc.
51. Technical Strategy Associates
52. TelesciCOM Ltd.
53. US WEST Advanced Technologies
54. WFI
55. WNP Communications,Inc.
56. WaveCom Electronics Inc.

57. WaveSpan Corporation
58. Wavtrace
59. WinNet MCS
60. WinStar Communications, Inc.
61. Wireless Communications Association Int'l
62. Wytec Inc.

Appendix D: Coexistence Task Group Meeting

Several interference issues were identified by the coexistence task group during our meeting on March 12 in Austin, Texas. These issues include:

1. among BWA systems which are 802.16 compliant.
2. of 802.16 compliant systems with non-compliant systems, including legacy and BRAN systems.
3. Guard band(s) between BWA "spectrums" and adjacent spectrum.
4. of BWA systems with satellites which share the band.
5. of point-to-multipoint systems with point-to-point systems in the same band.
6. of BWA systems across BTA boundaries.
7. of BWA systems along international boarders.
8. Electromagnetic interference and electromagnetic compatibility.

The group deemed it critical to begin addressing these issues even while the coexistence PAR is being prepared. To this end, the coexistence task group identified a set of study task which will help resolve the issues listed above. The study task will be conducted through an ordered set of papers on ***specific*** subjects. The subject matter will be selected to focus the task group's effort on developing a coexistence practice which will resolve as many coexistence issues as possible. The goal of this task group is to develop recommended practices which will enable BWA systems to coexist while providing maximum flexibility of choices for services offered, hardware/software implementations, deployment profiles, type of customers served, etc.

There are many interrelated technical parameters that affect coexistence. Some of these were presented for information and discussion at our meeting the week of March 12. They included papers from Bosch Telecom, Ericsson and Newbridge on proposed band plans, interference along license boundaries and unwanted emissions. These papers not only provide a good basis for beginning our work, but also provide insights into the various system architectures which are being proposed or developed as they relate to coexistence. The following topics were identified by the coexistence task group as needing additional study:

1. Additional Band Plans including both FDD and TDD systems
2. Antenna Characteristics
3. EIRP and Power Spectral Density
4. with satellite systems
5. Special coexistence needs, if any, for Block B systems
6. EMI/EMC
7. Population densities and distributions along license boundaries.

To these topics I would add the following:

1. Recommendations for evaluating interference effects on different BWA systems;
2. Methodology for evaluating interference between hubs in a non-flat-earth environment;
3. Recommendations for in-band emissions mask;
4. Identification of impediments to coexistence for international BWA systems;
5. Proposed approaches in system architectures which would reduce unwanted emissions;
6. Proposed approaches in system architectures for reducing the susceptibility of BWA systems to interference; and
7. Identification of band plans, channel plans, antenna characteristics, etc. of point-to-point systems which may share the band.

The coexistence group has elected to issue a call for contributions in certain areas. A call for contributions on subjects particularly relevant to the development of the coexistence PAR will be issued in the short term. Contributions from this call will be used to focus the groups activity at our meeting in May in Bolder.. Subsequent calls will solicit inputs which address the content of the coexistence practice or standard.

We expect to identify other study task in the future. The coexistence task group solicits the identification of additional issues or proposed solutions related to coexistence from all members of the 802.16 working group.

In addition, the following definition was proposed for coexistence in the context of our task group:

means using the allocated spectrum to provide more than one service and/or using more than one type of transmission format within the band without causing harmful interference to each other. As a minimum, coexistence will apply to systems deployed by different license holders in adjacent or near-by BTAs or country boarders.

Comments are also solicited on the definition of coexistence.

Appendix E: System Requirements Task-Group

The following working documents are cleaned up versions of those discussed at the Austin meeting. See http://grouper.ieee.org/groups/802/16 (or more precisely, http://grouper.ieee.org/groups/802/16/sysreq/index.html) for the documents.

802.16sc-99/1
System Requirements Outline
Michael Stewart
80216sc-99_1.pdf

802.16sc-99/2
802.6 Functional Requirements
80216sc-99_2.pdf

802.16sc-99/3
Reference Diagram
Margarete Ralston
80216sc-99_3.pdf

802.16sc-99/4
System Requirements Diagram Notes
Margarete Ralston
80216sc-99_4.pdf