WirelessHUMAN™ Study Group Activities at 802.16 Session #7

Document Number:
IEEE 802.16hp-00/03
Date Submitted:
2000-05-05
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Venue:
IEEE 802.16 Session #7 (1-5 May 2000 in Gaithersburg, MD, USA): First WirelessHUMAN™ meeting
Purpose:
To report WirelessHUMAN™ Study Group Activities at 802.16 Session #7.

WirelessHUMAN™ SG

WirelessHUMAN™ Goals

- Identify license exempt bands suitable for fixed broadband MAN access – e.g. 5-6 GHz bands
- Investigate feasibility of developing an Air Interface Standard for the identified bands
- Investigate feasibility of using common MAC/PHY with IEEE 802.11 / IEEE 802.16.3
- Investigate relationship with 802.11, 802.15 and other standards groups

Key Issues

- What are the existing regulations in the various unlicensed bands, and what unlicensed bands may be appropriate for WirelessHUMAN systems?
- What mechanisms for interference avoidance/suppression, resource sharing, and ensuring adequate performance exist in unlicensed bands?
- What are the unique system design issues/requirements of WirelessHUMAN systems from a MAC/PHY layer perspective?
- Should the Study Group write a PAR to proceed with a standard? If so, should we try for July or wait until November?

WIRELESSHUMAN AGENDA

Date	Time	
2-May	8:00	Joint meeting 802.16.3 & WHUMAN SG
		Introductions and member sign up
		Review of Goals and Objectives
		Discussion and Acceptance of Agendas
	10:00	Discussion of Key Issues (Chair)
	10:15	Study Group Operating Procedures (Secretary)
	11:00	The Path Towards Efficient Coexistence in Unlicensed Spectrum
		- 802.16hc-00/03 Contribution from Jon Peha
	12:30	Lunch Break
	1:30	Joint Session with 802.16.3
3-May	8:00	Joint Session with 802.16.3
	12:30	Lunch
	1:30	Requirements for WirelessHUMAN Systems
		- 802.16hc-00/01 Contribution from Mika Kasslin ai
	2:30	Requirements for Broadband Wireless Access systems in the UNII bands
		- 802.16hc-00/02 Contribution from Vijaya Gallager
	3:30	Break
	3:45	Discuss CEPT Proposal
	4:15	Discuss Report to 802.11/802.15
	5:30	Dinner Break
4-May		
	8:00	802.16hc-00/04 Overview of UNII Regulations
		Contribution from Jamie Cornelius
	9:00	Discussion of WirelessHUMAN Milestones & PAR
	12:00	Lunch Break

The Path Towards Efficient Coexistence in Unlicensed Spectrum

Contribution No: 802.16hc-00/03

Prof. Jon M. Peha

Carnegie Mellon University

Key Points

- Greedy Devices: little incentive to share spectrum
- Greed escalates => terrible performance
- Solutions: Low Utilization / Etiquette Modifications

Requirements for WirelessHUMAN™ Systems

Contribution No: 802.16hc-00/03

Mika Kasslin &Nico Van Waes

Key Points

- Need for coexistence
- UNII characteristics => limited range/large antennae; severe multipath
- Coexistence with 802.11: Dynamic frequency selection + power control + adaptive modulation
- 802.16.1 => different market & frequency => Not appropriate
- 802.16.3 => licensed, higher tolerated EIRP
- 802.15 => Small range; not applicable
- 802.11a => coexistence discussions mutually beneficial
  - PHY suitable for multipath; applicable (comment: coexistence with OFDM with high no. of carriers may be an issue - needs study)
  - MAC designed for ISM; not applicable
- System Reqs: coexistence with 802.11;low cost;high coverage;

  QoS support (in-system & extenral interference); standardized authentication;easy installation
- Flexible network; various topologies => complexity is an issue
  - PMP system only or mesh architecture
  - Delay architecture choice discussion for later
- July PAR

Requirements for Broadband Wireless Access systems in the UNII bands

Contribution No: 802.16hc-00/02

Vijaya Gallager

Key Points

- 802.11 MAC - not applicable => flexible architecture/mobile/roaming/range mismatch
- 802.16.1 MAC - not applicable => frequency/applications
- 802.16.1 PHY - not applicable => interference issues
- 802.11a PHY- not applicable => multipath; mobile;OFDM cost
- 802.16.3 PHY: not applicable => interference issues
- 802.15 PHY: not applicable => range mismatch
- System Req: No mandate on protocols; low cost; simplicity
- PAR => try for July

FCC Regulations - ISM

Jamie Cornelius

Key Points

- Spread Spectrum requirement in ISM bands
- 1 Watt max power
- Minimum of 75 hopping channels

CEPT Proposal

- Impact on 5250-5350 MHz UNII band
- Exclusive to radio lans

PAR discussion

- July
  - Broad statement
  - Avoid delay
  - Timing important to be effective
  - not enough study
  - Strong need for differentiation from existing standards
  - discuss par timeline after joint meeting (11 & 15)
  - discuss with Roger

Next Steps

- Email Reflector
- Conference Calls
  - 802.11/802.15/HIPERACCESS tutorials
  - PAR discussion
- Interim Meeting
- Call for contribution on SG report/assessment

WirelessHUMAN™ System Characteristics

- Metropolitan Area Network
- Services: voice, video & data
- Fixed/Nomadic Wireless Service Provider Application
- Operate in Unlicensed Frequency Bands (initial focus on outdoor UNII bands)
- Operation in presence of other unlicensed devices
- MAC/PHY efficiency to support MAN environment
- Cost and performance for residential/SOHO/SME/ customers
- QoS support (in-system & external interference)
- standardized registration/authentication
- ease of use & installation

Preliminary Assessment

- 802.16.3 PHY
  - TBD
  - Commonality in propagation characteristics
- 802.16.3 MAC
  - TBD
  - Potential synergies

Preliminary Assessment

- 802.11a PHY
  - Optimized for LAN peer-to-peer traffic and bandwidth requirements
  - Optimized for indoor multipath; needs evaluation for outdoors
  - No provision for dynamic frequency selection and power control
- 802.11 MAC
- MAC designed for ISM bands (Needs Evaluation)
  - assumption of negligible propagation delay
  - enforces Listen Before Talk (LBT) rule
  - Designed for bursty traffic, not for voice/CBR applications
- Centralized control (suitable for WirelessHUMAN)

Preliminary Assessment

- 802.15 PHY
  - Frequency Hopping
  - Current limitations on bit rates (1 Mbps)
  - Designed for 2.4 GHz ISM bands
- 802.15 MAC
  - Optimized for ad-hoc networking
  - Includes support for CBR
  - Designed for limited range applications

Preliminary Assessment

- 802.16.1 MAC
  - Not designed for interference in unlicensed bands
  - Designed for enterprise applications
  - Potential synergies based on common MAN requirements
- 802.16.1 PHY
  - Not designed for interference in unlicensed bands
  - Designed for above 11 GHz
  - Designed for LOS scenarios only

Preliminary Assessment

- HiperAccess PHY
  - Single carrier approach
  - Above 11 GHz
  - 28 MHz channel bandwidth
- HiperAccess MAC
  - TDMA based
  - Connection-oriented
  - guaranteed QoS
  - fixed length frame size and transmission slots
  - Supports FDD mainly, allows TDD for unpaired bands
  - Supports dynamic asymmetry for TDD
  - Adaptive modulation
  - Uses Convergence Layer to support multiple protocols

Preliminary Assessment

- HIPERLAN-2 PHY
  - Similar to 802.11a
- HIPERLAN-2 MAC
  - TDD based
  - ATM based solution
  - Support multiple CoS
  - centralized control
  - Assumes short propagation delay
  - Includes power control and dynamic frequency selection
  - Includes ARQ mechanism
  - Uses Convergence Layer to support multiple protocols