

Nikolich Coexistence preso at PIMRC2014

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Abstract

I was invited to participate on a Coexistence panel discussion at the 03 September 2014 IEEE Personal Indoor Mobile Radio Conference.

These are the slides I used during the panel discussion.

Unlicensed/Shared Spectrum Coexistence Panel

IEEE 802 Unlicensed Coexistence Overview

Paul Nikolich, Chairman IEEE 802 LMSC

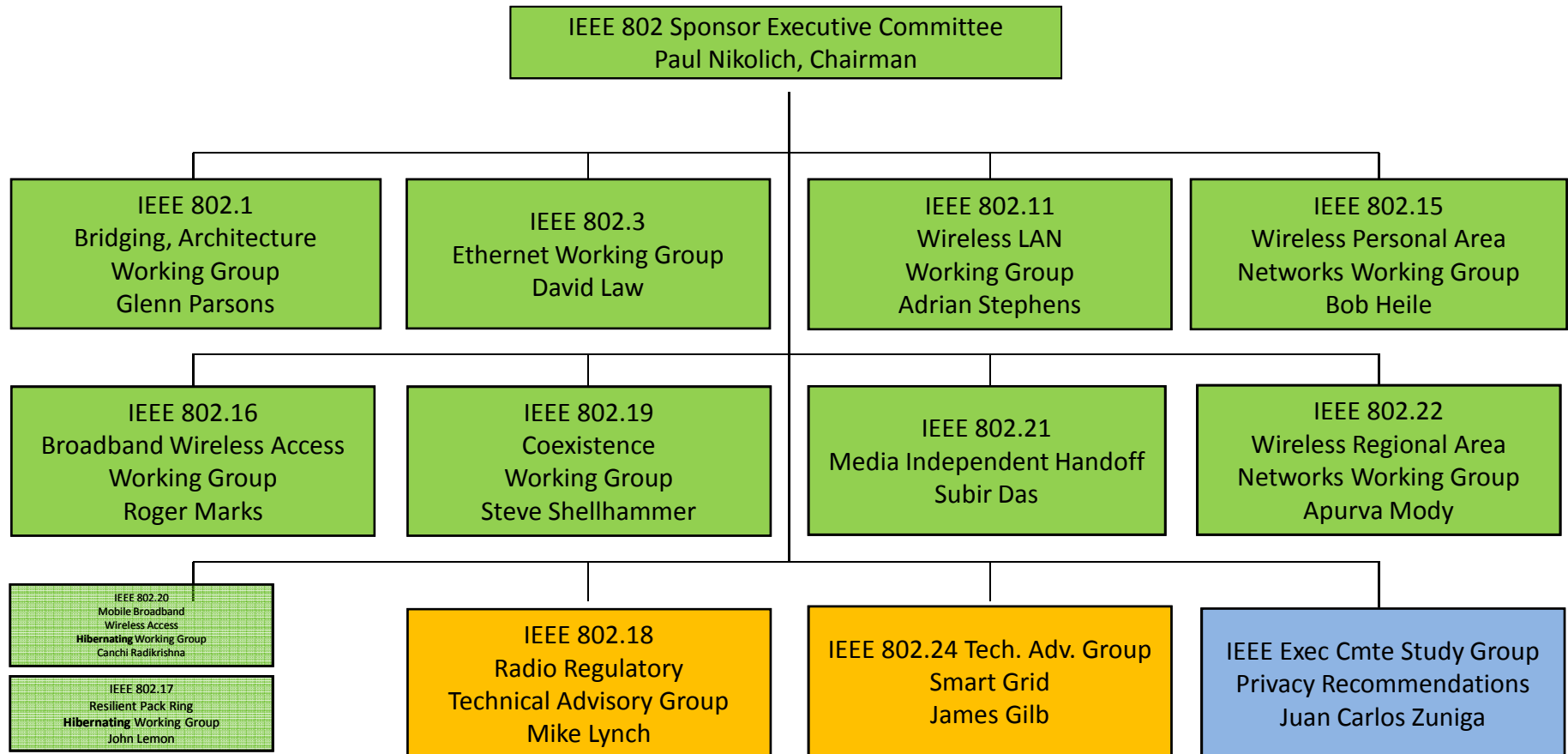
03 September 2014

IEEE PIMRC 2014

Disclaimer

- These slides represent my opinion, not that of IEEE 802
- All speakers presenting information on IEEE standards speak as individuals, and their views should be considered the personal views of that individual rather than the formal position, explanation, or interpretation of the IEEE

IEEE 802 Organization



Appointed Exec Comm members:
 Executive Secretary: Jon Rosdahl,
 Recording Secretary: John D'Ambrosia,
 Treasurer: Clint Chaplin,

1st VC: Pat Thaler
 2nd VC: James Gilb,
 Member Emeritus: Geoff Thompson

Coexistence in 802

802 experts have been pondering coexistence questions for a very-long-time. These questions were asked circa 2001/2002:

- What is Coexistence?
 - the effects of interference among wireless devices that are physically near one another
 - Two wireless devices are said to *coexist* if they can be brought near one another without significant degradation in their performance
 - The term “significant” is open to interpretation
- What is a “coexistence metric?”
 - A number, typically derived from a model, that quantifies the extent to which device A is expected to interfere with and be interfered by device B.
 - The level of detail required in the model is debatable, but simple is desirable.
- 802 Chartered the 802.19 Coexistence Group in 2002
 - Oversees the development of ‘Coexistence Assurance’ documents
 - Initially a Technical Advisory Group, now a Working Group

802 Procedure for coexistence assurance

If indicated in the five criteria, **the wireless WG shall produce a coexistence assurance (CA) document** in the process of preparing for WG letter ballot and Sponsor ballot. The CA document shall accompany the draft on all wireless WG letter ballots.

The CA document shall address coexistence with all relevant approved IEEE 802 LMSC wireless standards specifying devices for unlicensed operation. The WG should consider other specifications in their identified target band(s) in the CA document.

The IEEE 802.19 WG shall have one vote in WG letter ballots that include CA documents. As part of its ballot comments, the IEEE 802.19 WG will verify the CA methodology was applied appropriately and reported correctly.

The ballot group makes the determination on whether the coexistence necessary for the standard or amendment has been met.

A representative of the IEEE 802.19 WG should vote in all wireless Sponsor ballots that are in the scope of the IEEE 802.19 coexistence WG.

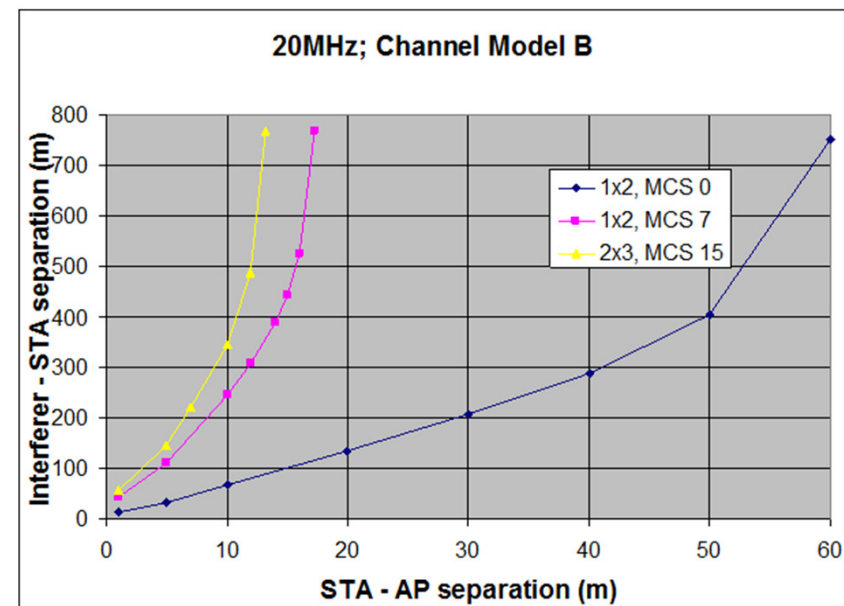
Coexistence Assurance Examples

- 802.11n/ac CA documents considers CCA operational performance in the presence of 802.15.x, 802.16, cordless telephone and UWB. An interference free link is defined to be PER of less than 1%.



Figure 1: Basic PHY geometric model

802.16/802.11n coexistence analysis performed in 2006



Coexistence Assurance Examples

- 802.15.2 Recommended Practice published in 2002
Coexistence of WPAN with Other Wireless Devices Operating in Unlicensed Frequency Bands
- 802.11y-2008 3650-3700 MHz Operation
 - Clear Channel Assessment and Energy Detect
- 802.16h-2010 Improved Coexistence Methods for License-Exempt Operation
 - Coordinated and Uncoordinated
- 802.11 Radio Regulatory Standing Committee - ongoing
 - DSRC “Tiger Team” evaluating the feasibility of sharing of the 5850-5925MHz band between DSRC and 802.11 extensions

802.19 Coexistence Group documents

Project	Coexistence Assurance Document
IEEE 802.11n	IEEE 802.11-06/0338r4
IEEE 802.11y	IEEE 802.11-07/2066r1
IEEE 802.11ac	IEEE 802.11-11/0493r0
IEEE 802.11ad	IEEE 802.11-10/1025r5
IEEE 802.11af	IEEE 802.11-11/177r0
IEEE 802.11ah	IEEE 802.11-13/1088r2
IEEE 802.19.1-2014	Standard for TV Whitespace Coexistence Methods
<p>5.4 Purpose: The purpose of the standard is to enable the family of IEEE 802 Wireless Standards to most effectively use TV White Space by providing standard coexistence methods among dissimilar or independently operated TVBD networks and dissimilar TVBDs. This standard addresses coexistence for IEEE 802 networks and devices and will also be useful for non IEEE 802 networks and TVBDs.</p>	

Project	Coexistence Assurance Document
IEEE 802.15.4a	IEEE 802.15.4 Standard. Annex E
IEEE 802.15.4b	IEEE 802.15.4 Standard. Annex E
IEEE 802.15.4e	IEEE 802.15-10/737r4
IEEE 802.15.4f	IEEE 802.15-10/918r0
IEEE 802.15.4g	IEEE 802.15-10/668r5
IEEE 802.15.4i	IEEE 802.15-10/808r0
IEEE 802.15.4j	IEEE 802.15-12/206r3
IEEE 802.15.4k	IEEE 802.15-12/314r1
IEEE 802.15.4m	IEEE 802.15-13/70r0
IEEE 802.15.4n	IEEE 802.15-14/81r1
IEEE 802.15.4p	IEEE 802.15-13/212r1
IEEE 802.16h	IEEE 802.19-09/07r0

Summary

- Licensed exempt operation/CCA
 - 802.11 and 802.15.1/4 interfaces widely deployed and perform well at 2.4GHz and 5GHz using Carrier Sense Clear Channel Assessment
- TV Whitespace/Geodatabase
 - 802.11af, 802.15m and 802.22 use geodatabase
- Administrative coordination
 - 802.16h using sync'd clock sources and administrative coordination techniques
- No coexistence
 - 802.20 Mobile Broadband Wireless Access

Observations in Going Forward...

- What are the market drivers?
 - Need to support coexistence of a wide array of devices and technologies (mostly uncoordinated)
 - Low cost, good performance
 - Density and number of devices will increase
- Other important drivers?
 - Unlicensed spectrum is a limited resource that can be fairly utilized to maximize public utility—802.11 is a proof point
 - Uncoordinated operation is a dominant requirement for ease-of-use
 - Universal ‘polite’ operation is essential