Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	Full case study on the scenario of coexistence
Date Submitted	**2006-11-~~11~~ 12**
Source(s)	Wu Xuyong, Huawei Huawei Industrial Base, Bantian, Longgang, Shenzhen 518129 P.R.C Voice: +86-755-28972327 Fax: wuxuyong@huawei.com
Re:	80216h-06_059：IEEE 802.16 Working Group Working Group Letter Ballot #24 (2006-10-11)
Abstract	Propose to start a full case study on the scenario of coexistence
Purpose	To consolidate the working document.
Notice	This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.
Patent Policy and Procedures	The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <http://ieee802.org/16/ipr/patents/policy.html>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <mailto:chair@wirelessman.org> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <http://ieee802.org/16/ipr/patents/notices>.

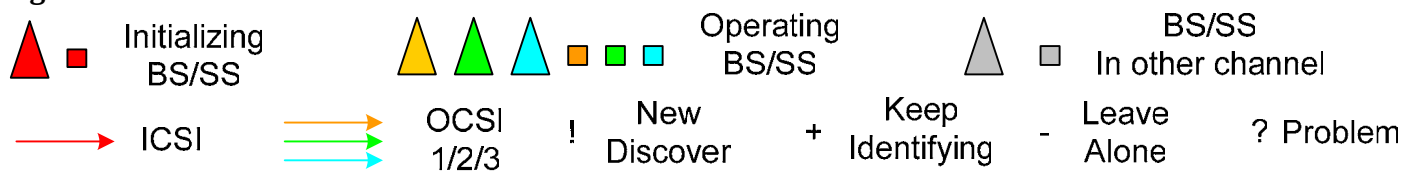
Full case study on the scenario of coexistence

Wu Xuyong
Huawei

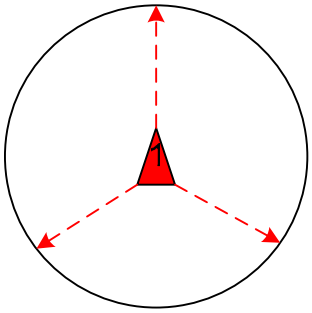
Overview

Here are some examples showing the potential overslaugh of the current solution within the draft1. It's not complete, just to make the way to be aware of all the general case we need to solve.

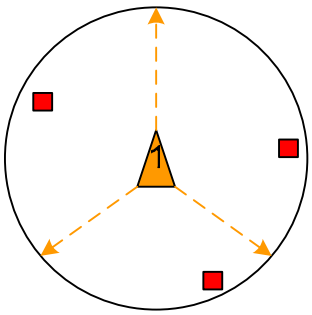
Legend:



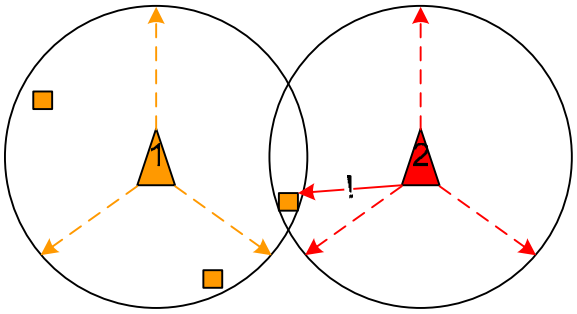
CASE I: SS initializing in blind area between non-neighbor systems in operation stage, while the systems are within one community/neighborhood.



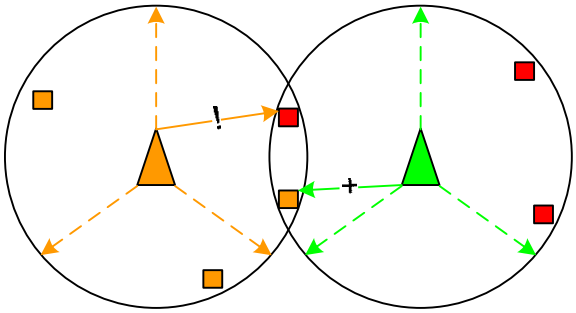
- **Initializing of BS1**



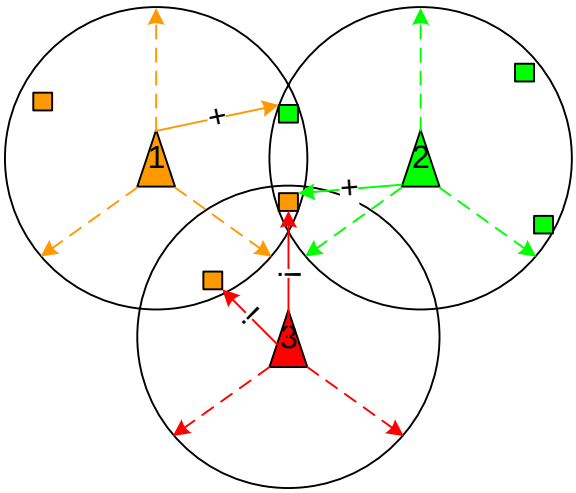
- **After BS1 initialized, SSs in system1 initialize in system1，**
- **(BS1 choose subframe1 and OCSI1)**



- **Neighbor BS(BS2) of BS1 initializing;**
- **!:One of the SSs in system1 discover the interference and signaling from system1.**
- **The SS report the BS1 and BS2 received the message from BS1.**



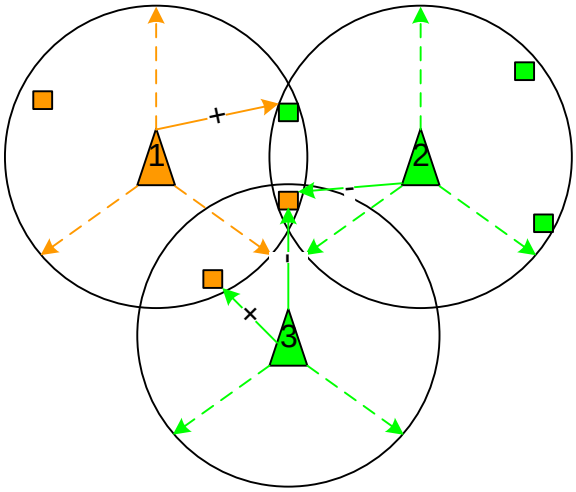
- **Being aware of the situation, BS2 chooses subframe2 and OCSI2.**
- **+: The SS in System1 which reported to BS1 now received signaling by BS2 in OCSI2.**
- **The SSs in system2 start initializing.**
- **!: One initializing SS discover the interference and signaling from BS1 in OCSI1.**



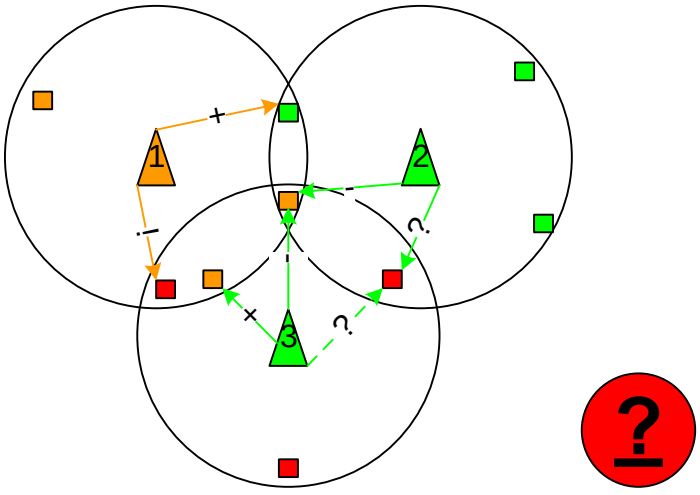
- **Here comes a BS3, which interfere with system1 but not interfere with system2 yet.**
- **!!: Two SS in system1 discover the interference and signaling from initializing BS (in ICSI).**

- **BS1 is aware of the situation of initializing BS by the report of the SS. The SS in the middle now can receive interference and signaling from two BS. When contact BS2, should BS1 tell BS3 that BS3 have an overlapping coverage with BS2?**
- **According to current situation, BS3 had better use subframe2 so that every system can use 2/3 of the resource.**
- **But which OCSI should BS3 choose is a branch point. We have two branches in this analysis, each one lead to some issue we need to solve. Finally, we need to choose one of the branches to be use in further solution.**

Branch A assumption: OCSI unified with Subframe ID

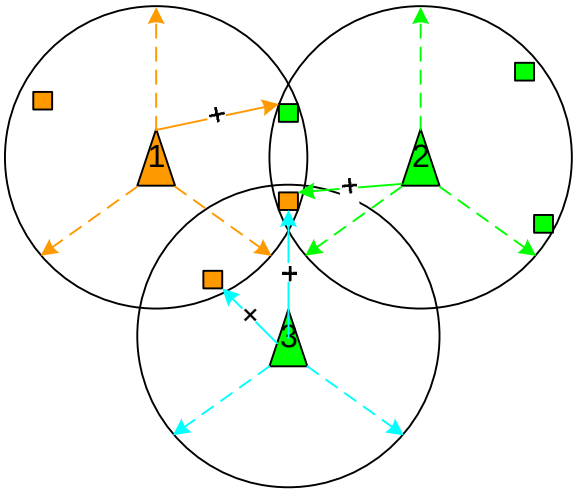


- **--: BS3 choose OCSI2 as well as BS2, now the SS which detect the signaling from both BS2 and BS3 become blind in OCSI2. Anyway, it is still able to detect any initializing BS's signaling in ICSI. (Notice: system3 is not neighbor of system2 now.)**

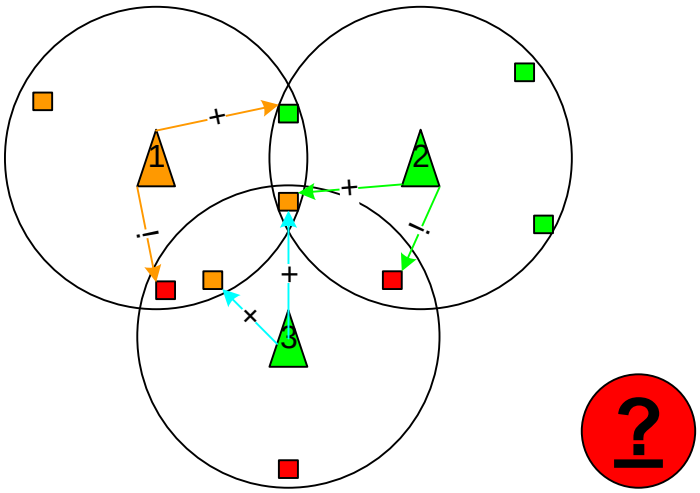


- **??: Here comes the question in branch A: when SS in system3 initialize in the common coverage between System2 and System3, the SS may be not able to decode anything neither in subframe nor in OCSI2. Besides, the problematic SS is not able to send signal to its serving BS according to current draft1 solution yet.**

Branch B assumption: no OCSI reuse in any coexistence neighborhood



- **In community (neighborhood) within system1, no reuse of OCSI. With awareness of the current OCSI occupation situation of its neighbor system1, BS3 choose OCSI3. (Notice, in this branch, OCSI is random chosen in fact, with the no reuse principle. Here we say OCSI3 just for easy expression).**
- **++: So this SS is able to continue monitoring the interference signaling in OCSI2 and OCSI3 now.**

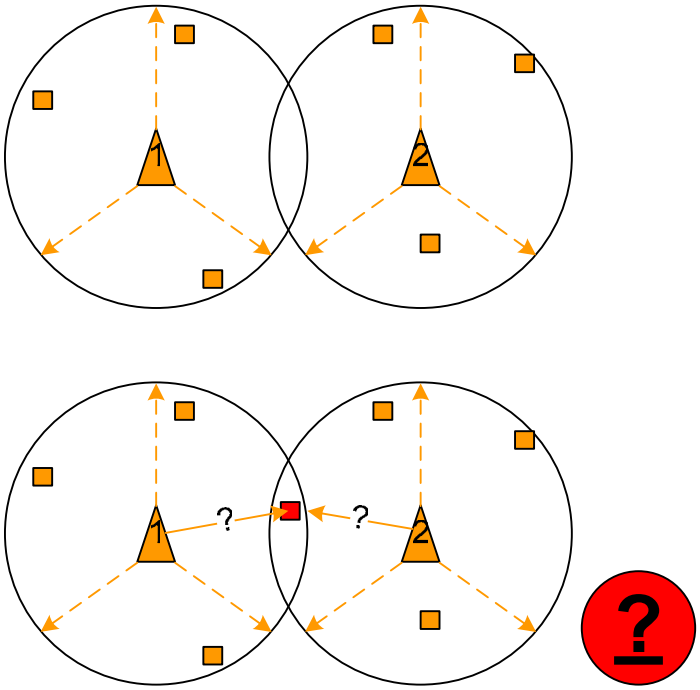


- **!: The SSs in system3 initialize, the SS in the common coverage of system2 and system3 can discover the signaling within OCSI2 and OCSI3. So the SS can identify the interference source.**
- **??: Here comes the question in branch B: How can the SS know which one is his serving BS and how to enter the serving BS's network system?**

Conclusion in CASE I study:

1) To prevent reusing OCSN in neighborhood seems good for the initialing SS to identify each interference source. We should continue on the scheduling solution in 15.3.1.1.1 and make the related content in rest part consistent with it. This means we should choose branch B to work on.
2) Problem found in case study should be solved, and need further effort.

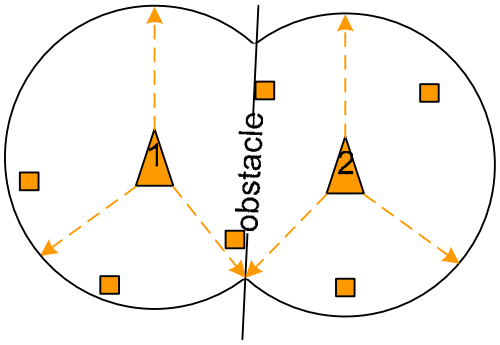
CASE II: SS initializing in blind area between non-neighbor systems in operation stage, while the systems are not within one community. (This case has been studied in Shulan's contribution C80216h-06_094.doc and is discussed with ad hoc)



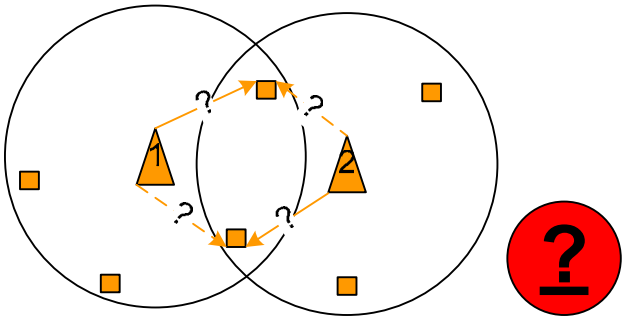
Conclusion in CASE II study:

1) SS initializing in blind area should have a reliable resolution.

CASE III: Systems in operation stage become neighbor because of the environment change. (This case is studied in another contribution for principal and waiting for full resolution of text changes.)



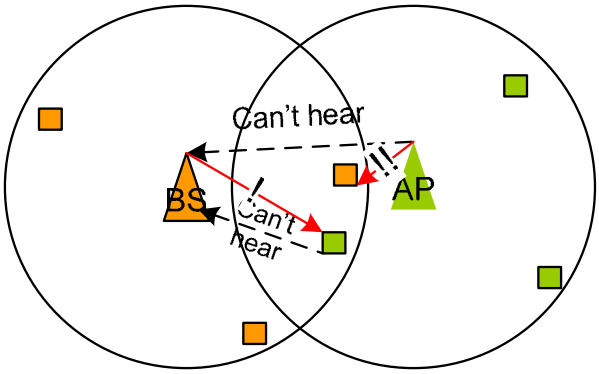
Become>>



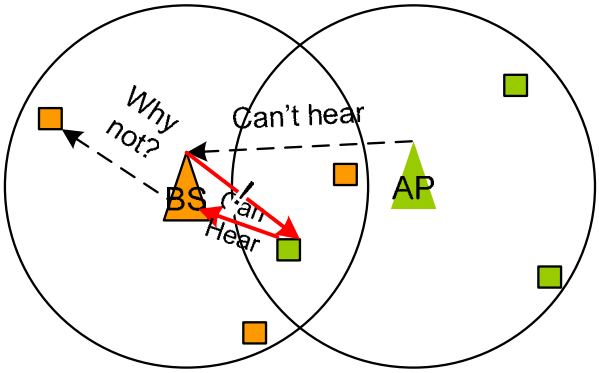
Conclusion in CASE III study:

1) We need some mechanism for the collusion detection and resolution for the coexistence interval allocation.

Case IV: Listen-before-talk invalidation case for operating WirelessMAN-CX system



1) "!": WirelessMAN-CX BS can hear neither the interference from the SS nor the interference from AP, so the BS can not prevent interfering with the SS in the AP system.
2) "!!": the SS in the BS system may hear the interference and report to BS, but the reflect time need for the BS reacting within the listen-before-talk mechanism can not easily meet the requirement of the timing.



1) The red arrow and "!": The BS can hear the signal from SS to AP, but not able to hear the AP. **So the BS can't prevent the interference to the AP's SS even if the BS can hear the victim.**
2) The red arrow and "Why not": The BS can hear the signal from SS to AP, so the BS is ceasing transmition when this SS in AP system is talking. Notice, in the mean time, the SS to AP transmition is not interfering with the traffic from the BS to its SS. So why not use this time to talk with the SS. In fact, even if the BS can hear the AP, the question is still there.

Conclusion in CASE IV study:

1) Simple Listen-before-talk feature is not a reliable for interference prevention.
2) Timing issue is to be seriously considered for the potential listen&report-before-talk feature.

Further CASE study needed for the integrity of solution in current draft.

Reference:

[1] *IEEE P802.16h/D1: Working Document for P802.16h (2006-08-01)*

[2] *80216h-06_059：IEEE 802.16 Working Group Working Group Letter Ballot #24 (2006-10-11)*

[3] *IEEE 802.16-2004: IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed Broadband Wireless Access Systems (2004-10-01)*

[4] *IEEE 802.16e-2005: IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems Amendment 2: Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands and Corrigendum 1 (2006-02-28)*

Proposal:

1) Make the related content in rest part of draft1 to be consistent with the scheduling solution in 15.3.1.1.1.

2) Remedy on 6.4.3.5 listen-before-talk or delete it.

3) Continue study on all the cases within initializing stage of SS and the operation stage of BS/SS.