Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Entering the community using coexistence proxy**
Date Submitted	**2006-02-28**
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Re:	80216h-06_005：Call for Comments and Contributions: IEEE 802.16 License-Exempt Task Group (2006-02-06)
Abstract	Broadcasting the IP address of BS is putting the BS into risk of being attacked from the internet, to use coexistence proxy between BSs in coexistence negotiation and cooperation could be a way out.
Purpose	To consider a acceptable way of delivery the contact information between BSs in a community.
Notice	
Release	
Patent Policy and Procedures	

Entering the community using coexistence proxy

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Overview

We have a fundamental need of communicating among the BSs in one community through the IP network, it's necessary for the negotiation and coexistence coordination.

Considering the risk to publish the IP address of base station, we need some coexistence proxy which will be used to associate the BSID with the IP address and prevent the transmission of the IP address over the air.~~between the BSs belonging to different operators so that the IP address of the base station which work for the data service and network management could be hidden from the hostile user in the internet.~~

Resetting the IP address of coexistence proxy or switching to the backup proxy may solve the accident while the coexistence proxy get problems from hostile attack. By doing these, the service and network management of the BSs may not be influenced in that case.

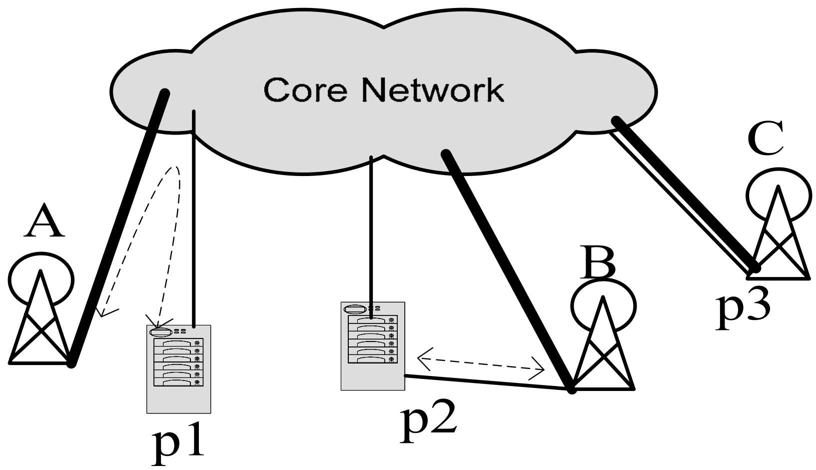
Reference:

[1] *IEEE 802.16-06/004: Working Document for P802.16h (2006-02-06)*

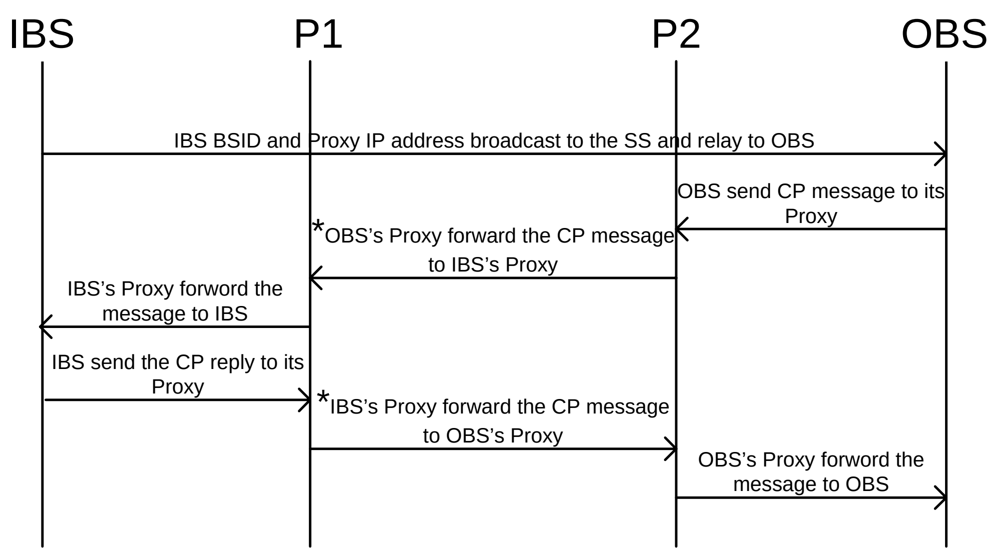
[2] *IEEE C802.16h-06/019: CTS scheduling for IBS and OBS (2006-02-28)*

Abbreviations and acronyms

Proposal



Every BSs optionally needs to use its a coexistence proxy to send/receive the coexistence messaging to/from other base stations situated in different networks so that the IP message, transmitting messages of the CP, will not contain the BS IP address.the unconversant other BSs will not know the IP address of the BS itself. The coexistence proxy should have a stand alone physical port and an IP address to connect into the internet, it can connect to the BS through internet(A&p1), direct link(B&p2) or internal interface(C&p3). The coexistence proxy could be a module of BS (p3) or a server stand alone(p1/p2).



*only needed when P1 and P2 are not the same

For a new entering BS, it need to know the IP address of its coexistence proxy. By broadcasting the IP address of its coexistence proxy and the BSID, all the neighbor OBSs get these contact information should start to communicate with this IBS through internet via coexistence proxy. After receiving the CP request message from OBS, the OBS's coexistence proxy will then transform the source IP address into the IP address of the proxy, and forward the CP request message to the destination coexistence proxy which serves IBS. The IBS's coexistence proxy should get the destination BSID by parsing the CP request message, and map it into IBS's IP address. If the BSID is in the coexistence proxy service list and find the corresponding IP address, the coexistence proxy should forward the qualified CP request message to the IBS. Vice versa, IBS should send the CP reply message to the OBS via the coexistence proxy after receiving and processing the CP request message.

Coexistence proxy is used to forward the CP message between ~~unconversant~~ BSs, the proxy will isolate the BSs from ~~foreign unconversant~~ BSs and terminals in the internet. In the coexistence coordination process, all the BSs will not know ~~other~~ the ~~unconversant~~ BSs' IP address, and contact ~~others unconversant~~ BSs only via coexistence proxy and the BSID information. In order to prevent various attack from the internet, proxy could utilize various approach to protect the data service of BSs ~~without~~ from being influenced ~~the data service of BSs~~. [Proxy could limit the forwarding bandwidth from one IP address or to one BSID. Proxy could qualify or block the message using various approach.]

Proposed text changes

Add the following section into clause 3. Definitions:

Coexistence Proxy*(CXPRX)**:** Coexistence proxy isolates their BSs from the ~~unconversant~~ ~~foreign~~ BSs and terminals in the internet. ~~, it i~~Shall be used when the IP contact information is transmitted over the air and ~~s~~can be optionally used to forward the CP message between ~~unconversant~~ coexistence BSs over the backbone. In the coexistence coordination process, all the BSs will not know other ~~unconversant~~ BSs' IP address, and contact ~~unconversant~~ BSs ~~others~~ only via coexistence proxy and the BSID information. In order to prevent various attack from the internet, coexistence proxy could utilize various approach to protect the data service of BSs ~~without~~ from being influenced ~~the data service of BSs~~.*

Random Temporary Key *(RTK): the temporary key generated and sent by the BS, contained in the air signaling, which is required to be contained in the request messages of coexistence protocol sent to this BS. RTK is used to obstruct the coexistence request from the unqualified internet terminals.*

Add the following items into clause 4. Abbreviations and acronyms

CXPRX	**Coexistence Proxy**
RTK	**Random Temporary Key**

Change section 11.11 as indicate:

11.11 REP-REQ management message encodings

[insert the following entry in the second table of 11.11:]

Coexistence neighbor Interference Report	1.9	1	Bit #0: 1-include ~~IP address~~ information received in ~~IPBC~~ BS_NURBC Bit #1: 1-include RSSI of CTS symbols(only valid when bit#0 is set to one) Bit #2: 1-include frame number that start to receive ~~IPBC~~ BS_NURBC Bit #3~7: reserved, shall be set to zero
ExChNr	1.10	2	Physical extended channel number (WirelessMAX-CX only)
Extended report type	1.11	1	Bit #0 = 1: Include extended report type A Bit #1 = 1: Include extended report type B Bits #2 - #7: Reserved

Change section 11.11 as indicate:

11.12 REP-~~REQ~~ RSP management message encodings

[insert the following entry in the first table of 11.12:]

Coexistence neighbor Report	7	variable	Compound
Extended report type	8	variable	Compound

[insert the following table into 11.12 as indicates:]

Coexistence neighbor Interference Report type	**Name**	**Type**	**Length**	**Value**
all	CoNBR count /New NDS	7.1	1	Bit #0:1-New CoNBR Discovered by ~~IPBC~~ BS_NURBC received Bit #1-7:The number of CoNBR that interference to this SS
bit #0=1	~~CoNBR IP address~~ ***Neighbor update request report IPv4***	7.2	~~4~~12	**Bits 15:0—RTK** **Bits 63:16—BSID** **Bits 95:64—BS IP address(IPv4)** 4bytes IPv4 address of CoNBR interference to this SS, 255. 255. 255. 255 indicate the fail of CRC check.
bit #0=1	***Neighbor update request report IPv6***	7.3	24	**Bits 15:0—RTK** **Bits 63:16—BSID** **Bits 191:64—BS IP address(IPv4)** 16bytes IPv6 address of CoNBR interference to this SS, all ones indicate the fail of CRC check.
bit #1=1	~~CoNBR IP address with~~ BS_NURBC	~~7.3~~7.4	2	1byte RSSI mean (see also 8.2.2, 8.3.9, 8.4.11) for details) 1byte standard deviation

	RSSI			
Bit #2=1	Starting Frame Serial Number of ~~IPBC~~ BS_NURBC	~~7.4~~7.5	3	Bit# 0-24: frame number of BS_NURBC ~~IPBC~~ starting frame

REP-REQ Extended report type	Name	Type	Length	Value
Bit #0 = 1 OR Bit #1 = 1	ExChNr	8.1	2	Extended physical channel number to be reported on.
Bit #0 = 1 OR Bit #1 = 1	WirelessMAX-CX interference indicator	8.2	1	Bit #0: Low interference indication Bit #1: Medium interference indication Bit #2: High interference indication Bit #3: Primary user detected on the channel Bit #4: Channel not measured.
Bit #1 = 1	Zone specific CINR report	8.3	2	1 byte: mean 1 byte: standard deviation
Bit #1 = 1	Zone specific RSSI report	8.4	2	1 byte: mean 1 byte: standard deviation

Insert a new section 15.2.1.1.6:

15.2.1.1.6 Coexistence proxy:

Every BSs ~~need~~shall ~~to~~ use its coexistence proxy to send/receive ~~the coexistence~~messages containing the IP contact information over the air ~~messaging to/from other base station~~ so that ~~other unconversant~~ BSs will not know the IP address of thise BS ~~itself~~. The coexistence proxy should have a stand alone physical port and an IP address to connect into the internet, it can connect ~~to~~ the BS through internet, direct link or internal interface. The coexistence proxy could be a module of BS or a server stand alone.

Coexistence proxy ~~is~~can also optionally be used to forward the CP message between BSs, the proxy will isolate the BSs from ~~foreign unconversant~~ BSs and terminals in the internet. In the coexistence coordination process, all the BSs will not know ~~other unconversant~~ BSs' IP address, and contact ~~others~~ them only via coexistence proxy and the BSID information. In order to prevent various attack from the internet, proxy could utilize various approach to protect BSs without influence the data service of BSs. *[Proxy could limit the forwarding bandwidth from one IP address or to one BSID. Proxy could qualify or block the message using various approach.]*

Insert the following text at the beginning of section 15.2.1.3 as indicate:

15.2.1.3 Community Entry of new BS

To enter the existing community of its neighbors, a new BS without any associated SS need to get contact with his neighbors and coordinate using the IP network. The new BS should synchronize to the timing of the CTS and ICTS in the air before using ICTS ~~time slots~~ to broadcast the ~~neighbor update request~~ BS_NURBC (*see 15.6.6.2.1*) message to make its neighbor know its arrival and the contact information of thise new coming one.

ICTS is used ~~only~~ by IBS to establish communication with its neighbor BSs. Initializing BS (IBS) shall use ~~this~~ ICTS slot to broadcast its coexistence proxy's IP ~~identifier~~ address and ~~its~~the BSID of IBS, by sending a message and/or ~~by~~ cognitive radio signaling.~~,~~ So~~so~~ that the coexistence neighbor operating BS ~~(OBS)~~ could find the ~~new~~ initializing coexistence neighbor in IP network via its coexistence proxy after receiving the SS report for thise message. In order to obstruct coexistence request from unqualified internet terminal such as someone far away or some one without any capability of 16h air signaling~~,~~ which have known the static BSID and IP address information, the BS should put in a RTK (Random Temporary Key) in the broadcast massaging. To qualify the request of CP message, the RTK sender requires the request CP message sent back later via IP network to contain this random temporary key. Then the IBS and OBS begin further negotiation via their coexistence proxy for coexistence protocol. After coordination with the neighbors in the community, IBS will get periodical interference free OCTSs, and become OBS, after that, it will cease from using the ICTS.

The BS_NURBC (*see 15.6.6.2.1*) broadcasting procedure is unidirectional, only from the BS to the SSs in common coverage of the BS and its neighbors', and the SSs shall report all the useful information to their OBSs they associated to. The SSs that succeed in receiving the message should report the content of BS_NURBC and the frame number of the starting frame of BS_NURBC, the SSs which failed to received the broadcasting message but ~~got~~ get BS_NURBC ~~like~~ as interference in the CTS should report the error status and the starting frame number of receiving the interference in CTS. IBS use ICTS to broadcast BS_NURBC message, the content in the message will enable its neighbor systems to communicate with the IBS in the IP network to coordinate by coexistence protocol. By the IP address of IBS's coexistence proxy and the BSID reported from the SSs with RTK, the OBSs will then communicate with the IBS in the IP network via their coexistence proxy, and go further coordinate using IP network. And by checking the frame number in the report, OBS need to find out if the SSs that report the error status in BS_NURBC receiving have got the same interference source, then OBS will update the database and reply to the SSs which have send the error report.(*see figure hxx.*)

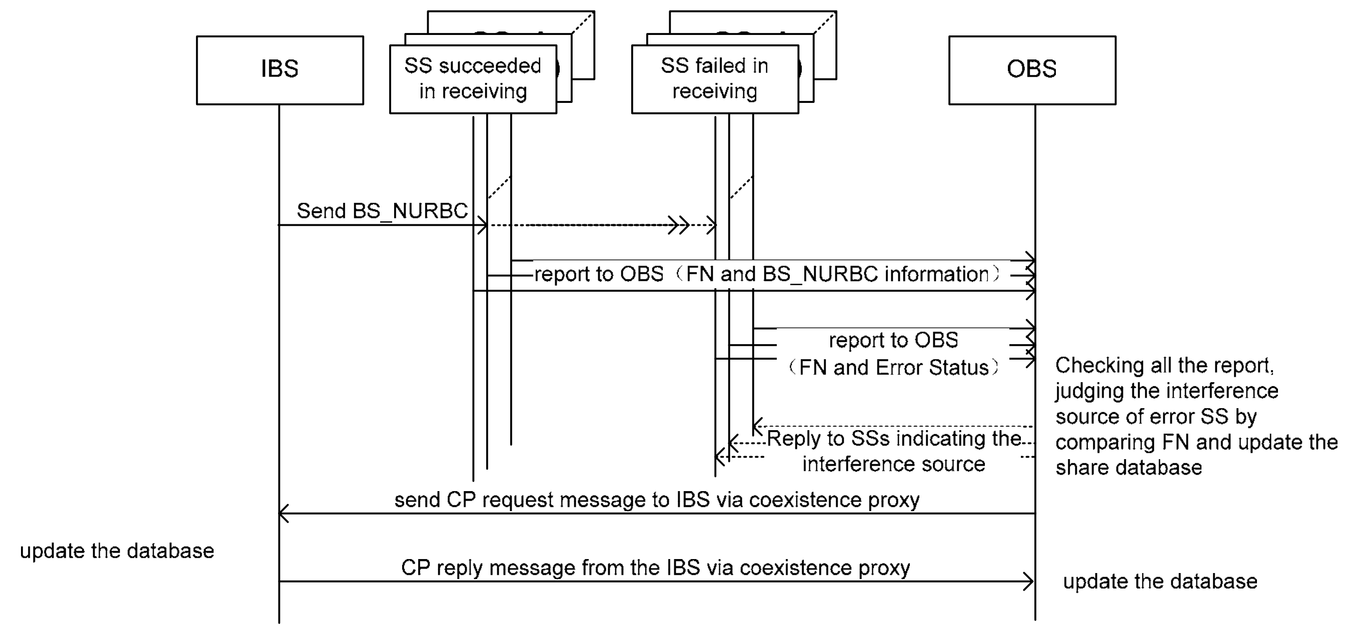
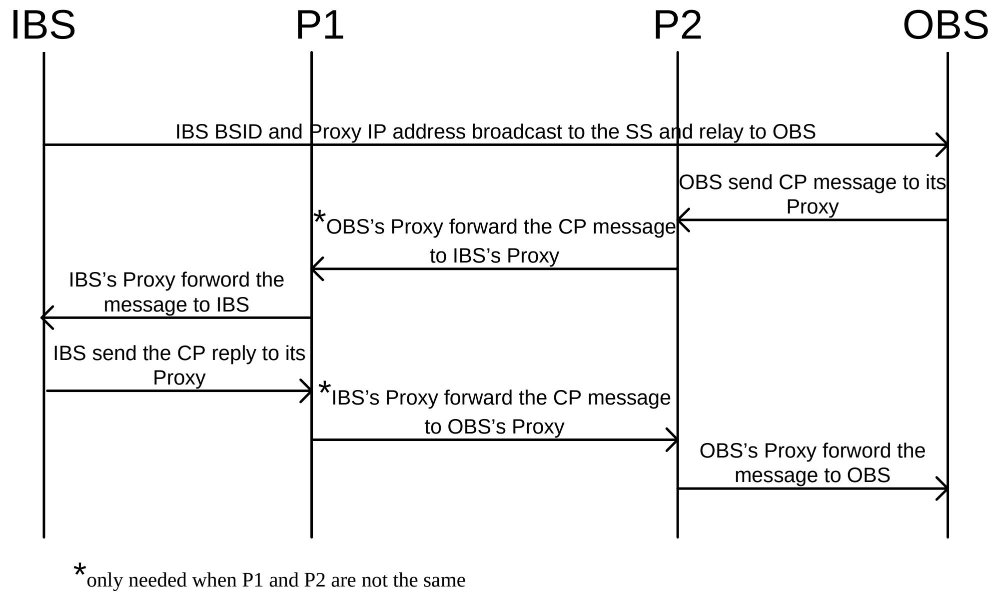


Figure hxx. IBS entering the community by neighbor update request broadcasting

For a new entering BS, it need to know the IP address of its coexistence proxy. By broadcasting the IP address of its coexistence proxy and the BSID of itself, all the neighbor OBSs get these contact information should start to communicate with this IBS through internet via coexistence proxy. After receiving the CP request message from OBS, the OBS's coexistence proxy will then transform the source IP address into the IP address of the proxy, and forward the CP request message to the destination coexistence proxy which serves IBS. The IBS's coexistence proxy should get the destination BSID by parsing the CP request message, and map it into IBS's IP address. If the BSID is in the coexistence proxy service list and find the corresponding IP address, the coexistence proxy should forward the qualified CP request message to the IBS. Vice versa, IBS should send the CP reply message to the OBS via the coexistence proxy after receiving and processing the CP request message.



Change section 15.6.6.2.1 as indicate:

15.6.6.2.1 ~~IBS_IPBC~~ BS_NURBC

~~IBS_IPBC~~ BS_NCRBC (BS Neighbor Update Request BroadCasting) message is the message broadcasted by the initializing base station or the operating base station which need to update the neighbor list in the database. It is sent to the SS in the coexistence neighbor network. It use the CTS frame to carry the IP address information of its coexistence proxy and the BSID from the ~~I~~BS to the SS, and the IP & BSID information shall be reported by the SS to ~~the~~ its serving coexistence neighbor BS. And the serving coexistence neighbor BS ~~will~~ should ~~find~~ communicate the initializing BS in the IP network via the coexistence proxy, and ~~then start~~ proceed the further coexistence negotiation.

RTK (Random Temporary Key) shall be random generated in the BS and broadcasted in BS_BURBC, neighbor BS which send CP request message need carry the RTK in the message. This will prevent the BS from being easily cheated by someone far away without any 16h airlink capability which have know the static contact information.

Table h20 —~~IBS_IPBC~~ BS_NURBC message TLV encoding

Name	*Type(1byte)*	*Length*	*Value (Variable length)*
~~IPBC_V4~~ NURBC_V4	*0*	***~~4~~ 12***	***Bits 15:0 —RTK*** ***Bits 63:16 —BSID*** ***Bits 95:64 —BS IP address(IPv4)***
~~IPBC_V6~~ NURBC_V6	*1*	***~~16~~ 24***	***Bits 15:0 —RTK*** ***Bits 63:16 —BSID*** ***Bits 191:64 — BS IP address(IPv6)***

Change section 15.2.1.8.1 as indicate:

15.2.1.8.1 Interferer identification

The interferers will be identified by their radio signature, for example a short preamble for OFDM/OFDMA cases. The radio signature consist of:

- — Peak power
- — Relative spectral density
- — Direction of arrival.

Every transmitter will send the radio signature during an interference-free slot. The *time position of this slot (frame_number, sub-frame, time-shift)* will be used for identification.

In IBS's coexistence neighbor discovery phase, the IBS's ~~IP address~~ contact information and RTK shall be broadcast using the ~~IPBC~~ BS_NURBC frame with pulse energy keying. And this shall be detected by coexistence neighbor's SS in the IBS's ~~reachable range~~ coverage *(see ANNEXC case 3)* and reported to its serving BS.

The ~~IP address~~ BSID is used to identify the coexistence neighbor BS by the receiver SS~~ in the IBS's coexistence neighbor discovery phase~~. And also be the identifier of the ~~I~~BS for ~~the~~ its coexistence neighbor BS~~ before the coexistence neighbor got in touch with the IBS in the IP network~~.

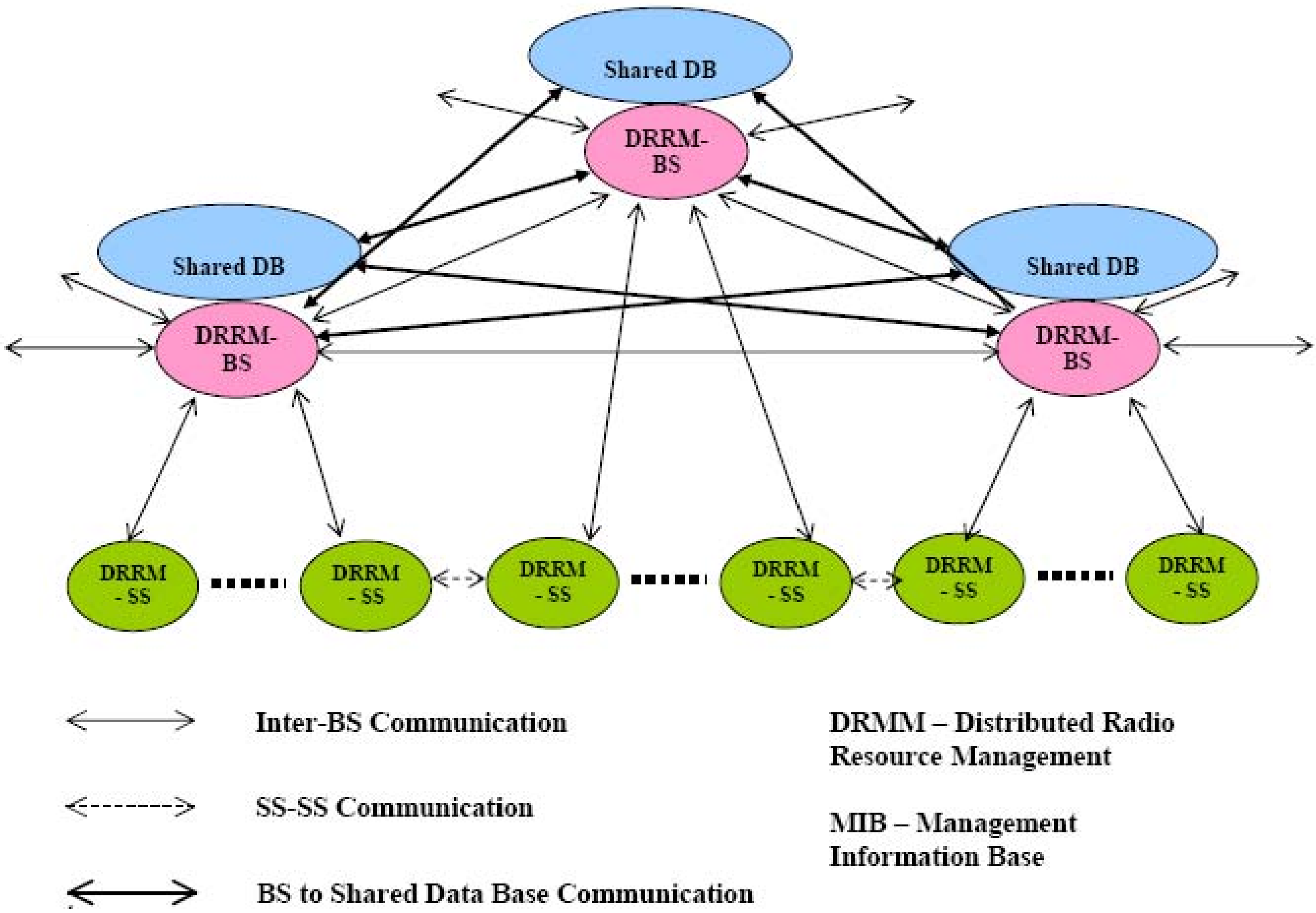
Change section 15.2.2.1 as indicate:

15.2.2.1 Architecture

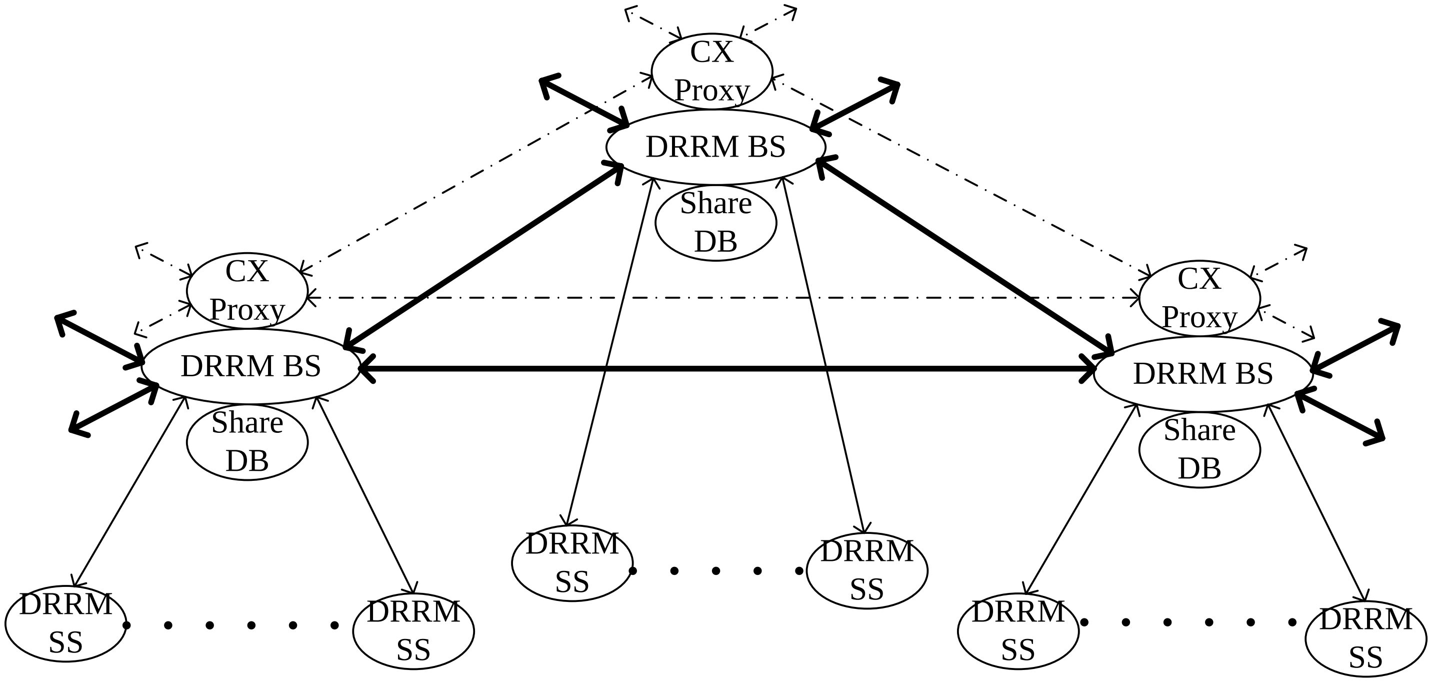
The architecture for Radio Resource Management in the context of IEEE 802.16h it is a distributed one and allows communication and exchange of parameters between different~~ networks~~systems. A ~~network~~ system consists from a ~~Base Station~~ base station and its associated ~~Subscriber~~ subscriber ~~Stations~~stations and its coexistence proxy.

Every ~~B~~base ~~S~~station includes a ~~D~~distributed ~~R~~radio ~~R~~resource ~~M~~management (DRRM) entity, to apply the 802.16h spectrum sharing policies, and a ~~D~~data ~~B~~base (DB) to store the shared information regarding the actual usage and the intended usage of the ~~R~~radio ~~R~~resource.

A subscriber ~~S~~station may include an instance of DRRM, adapted to SS functionality in 802.16h context. The following figure shows the functional diagram of the IEEE 802.16h network architecture:



Figureh18 —System Architecture type 1



Figureh18a —System Architecture type 2

Figure h19, Figure h19a shows the IEEE 802.16 LE type 1 and type 2 inter-network communication architecture:

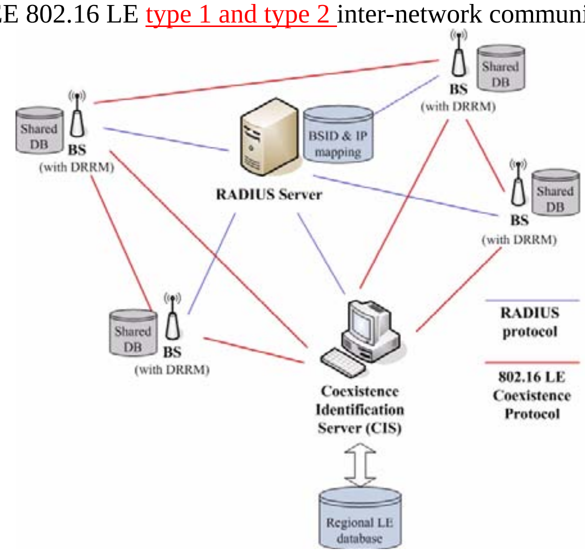


Figure h19 —Network architecture type 1

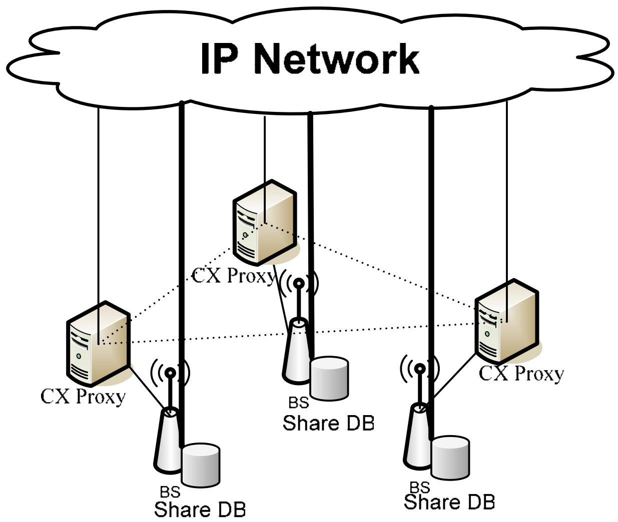


Figure h19a —Network architecture type 2

General architecture includes the components operating over IP-based network:

For network architecture type 1:

- The RADIUS Server- The Base Station Identification Server (BSIS), described in detail in section xxx - The BSs cooperating with the Distributed Radio Resource Management (DRRM) procedure RADIUS server to maintain the address mapping of wireless medium addresses of BSs (their BSID) and medium addresses of BSIS to their IP addresses.

For the network architecture type 2:

- The coexistence proxy of every base station maintains the mapping of the IP address and the BSID of their serving BSs. All the CP messages between the different systems should be sent and received via their coexistence proxies instead of directly between the base stations. So the IP address will not be known outside the system. The coexistence proxy will forward the CP messages for the base station.

Inter-network communication

The inter-network communication consists in:

- Inter-network *messages*
    - *o Base Station to/from Base Station*
    - *o Base Station to/from Subscriber Station to/from foreign Base Station; the subscriber Station is used as relay of signaling, if the two Base Stations are hidden one from the other*
- *Open access to DRRM Data Base (optionally via coexistence proxy when between ~~unconversant~~ systems):*
    - *o To read the parameters of the hosting Base Station*
    - *o To request c*hange of the hosting Base Station operating parameters.

Change Table h4 as indicate:

Table h2—This BS information table

Syntax	Size	Notes
This BS information table(){		
BSID	48bits	
Operator ID	?bits	
IP version	1bits	0-IPv4 1-IPv6
If (IP version = 0){		
IPv4 address	32bits	IBS IPv4 address
CXPRX IPv4 address	32bits	CXPRX IPv4 address
}		
Else{		
IPv6 address	128bits	IBS IPv6 address
CXPRX IPv6 address	128bits	CXPRX IPv6 address
}		
RTK	16 bits	Random Temporary Key
Extended Channel Number (ExChNr)	8bits	1 byte base reference to frequency range or deployment band. This reference maps to an absolute frequency value.
Extended Channel Number (ExChNr)	8bits	1 byte specific channel number reference
Channel spacing (ChSp)	16bits	2 bytes channel spacing value (10kHz increments)
Master resource ID	8bits	Sub-frame number
OCTS ID	8bits	CTSN of OCTS allocation
Negotiation status	8bits	Bit0: get communication in the IP network Bit1: be registered in Bit2: registered to Bit3: done for resource sharing(if neighboring) Bit4-7: tbc.
CTS parameter(){		Regulated by region/country
Tcts_start	16bits	In microseconds
Tcts_duration	8bits	In microseconds
Period of frames	8bits	frames
Starting frames offset	16bits	frame serial number of the first frame that CTS presented
Length of Symbols	8bits	In microseconds, need to be 1/n of Tcts_duration
ICTS cycle	8bits	ICTS cycle counted in CTS cycles

OCTS cycle	8bits	OCTS cycle counted in ICTS cycles
}		
Number of CoNBRs	8bits	m:The number of coexistence neighbors of this BS
for (i= 1; i <= m; i++) {		
BSID	48bits	
(Tbc.)	(Tbc.)	(Tbc.)
}		
Profile(){		
Band		
PHY mode(){		
Modulation		
(Tbc.)		
}		
Maximum power	8 bits	dbm
Number of registered SS	12bits	n
for (i = 1; i <= n; i++) {		
SSID	48bits	
(tbc.)	(tbc.)	(tbc.)
}		
(tbc.)	(tbc.)	(tbc.)
}		
}		

Table h3—BS information table

Syntax	Size	Notes
BS information table(){		
Index	16bits	
BSID	48bits	
Operator ID	?bits	
RTK	16 bits	Random Temporary Key
IP version	1bits	0-IPv4 1-IPv6
If (IP version = 0){		
CXPRX IPv4 address	32bits	CXPRX IPv4 address

}		
Else{		
CXPRX IPv6 address	128bits	CXPRX IPv6 address
}		
Sector ID	8bits	
Extended Channel Number (ExChNr)	8bits	1 byte base reference to frequency range or deployment band. This reference maps to an absolute frequency value.
Extended Channel Number (ExChNr)	8bits	1 byte specific channel number reference
Channel spacing (ChSp)	16bits	2 bytes channel spacing value (10kHz increments)
Master resource ID	8bits	Sub-frame number
OCTS ID	8bits	CTSN of OCTS allocation
Negotiation status	8bits	Bit0: get communication in the IP network Bit1: be registered in Bit2: registered to Bit3: done for resource sharing(if coexistence neighboring) Bit4-7: tbc.
Coexistence neighboring	1bit	Coexistence neighbor with this BS? 1-yes 0-no
If (Coexistence neighbor){		
Number of victim SSs	16bits	n:The number of victim SSs of this coexistence neighbor, in this network
for (i = i; i <= n; i++) {		
SSID	48bits	
RSSI	16bits	1byte RSSI mean (see also 8.2.2, 8.3.9, 8.4.11) for details) 1byte standard deviation
}		
(Tbc.)	(Tbc.)	(Tbc.)
}		
Number of Coexistence neighbors	8bits	m:The number of coexistence neighbors of this BS
for (i= 1; i <= m; i++) {		
BSID	48bits	
(Tbc.)	(Tbc.)	(Tbc.)
}		
Profile(){		
Band		
PHY mode(){		

Modulation		
(Tbc.)		
}		
Maximum power	8 bits	dbm
Number of registered SS	12bits	
(tbc.)	(tbc.)	(tbc.)
}		
(tbc.)	(tbc.)	(tbc.)
}		

Table h4—SS information table

Syntax	Size	Notes
SS information table(){		
Index	16bits	
SSID	48bits	
Interference status	1bit	Interfered by coexistence neighbor? 1-yes 0-no
If (Interfered){		
Number of source BSs	8bits	n:The number of interference source of coexistence neighbor
for (i = 1; i<= n; i++) {		
BSID	48bits	
~~IBS_IPBC~~ BS_NURBC detected	1bits	1-yes 0-no
If (~~IBS_IPBC~~ BS_NURBC detected){		
IP version	1bits	0-IPv4 1-IPV6
If(IP version =0){		
CXPRX IP address v4	32bits	the v4 IP address of the CXPRX reported by the SS .~~If the IBS_IPBC message detected, the IP address report by the SS will add here, and updating the bit above~~
}		
Else{		
CXPRX IP address v6	128bits	the v6 IP address of the CXPRX reported by the SS
}		
IBS BSID	48bits	The BSID reported by SS
RTK	16bit	RTK in the BS_NURBC reported by SS

Sector ID	?bits	Reported by SS
Frame number	24bits	Reported by SS
Error Status	?bits	0 -no error 1 - not capable to decode the energe pulse symbol.; 2 - not able to find the eligible <SOF>; 3 - not able to find the eligible <EOF>; 4 - not able to pass the CRC check for message;
(tbc.)	(tbc.)	(tbc.)
}		
RSSI	16bits	1byte RSSI mean (see also 8.2.2, 8.3.9, 8.4.11 for details) 1byte standard deviation
(tbc.)	(tbc.)	(tbc.)
}		
(tbc.)	(tbc.)	(tbc.)
}		
(tbc.)	(tbc.)	(tbc.)
}		