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Re:	Call for Contributions: IEEE 802.16 License-Exempt Task Group, IEEE 802.16h-05/018
Abstract	Propose the architecture of storage of identification information and Coexistence Protocol.
Purpose	Information.
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Architecture clarification and Coexistence Protocol

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1. Introduction

The paper is to complete the contents, primary the T.B.D parts, proposed in IEEE C802.16h-05/011r1 which has been accepted at session#37. Moreover, clarification about the 802.16 LE network architecture is presented.

2. Proposed text changes

[Change Figure 14 as following]

Figure 14 shows the classification of IEEE 802.16 LE inter-network communication architecture:

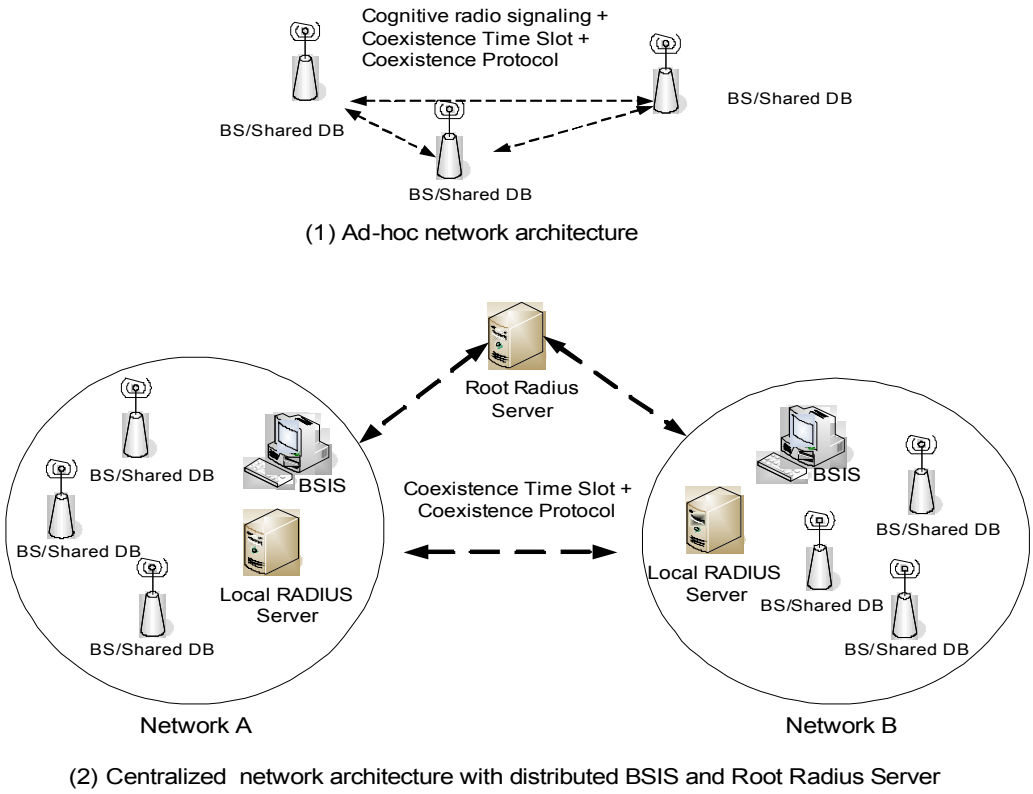

Figure 14. Classification of 802.16 LE network architecture

[Insert the following section before first paragraph of p.29]

IEEE 802.16 LE introduces two different kinds of network architectures:

- Ad-hoc network architecture

In ad-hoc network architecture, 802.16 LE ad-hoc systems can use cognitive radio signaling to interact with systems wising a Coexistence Protocol. There is no authentication server like RADIUS server to prevent rogue

BSs.

- Centralized network architecture with BSIS and Root Radius Server

In this network architecture, the 802.16 LE systems are aware of Coexistence Protocol. BS belonging to different network need to be authenticated by the local RADIUS server. BSs learn its neighbors by querying BSIS of different network and Coexistence Time Slot mechanism.

[Change first paragraph of p.29 as following]

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

- the Base Station Identification Server (BSIS, see 3.2.4.1),
- the local/Root RADIUS server (see 3.2.4.2), and
- the BSs cooperating with the Distributed Radio Resource Management (DRRM) procedure.

[Replace Figure 12 as following]

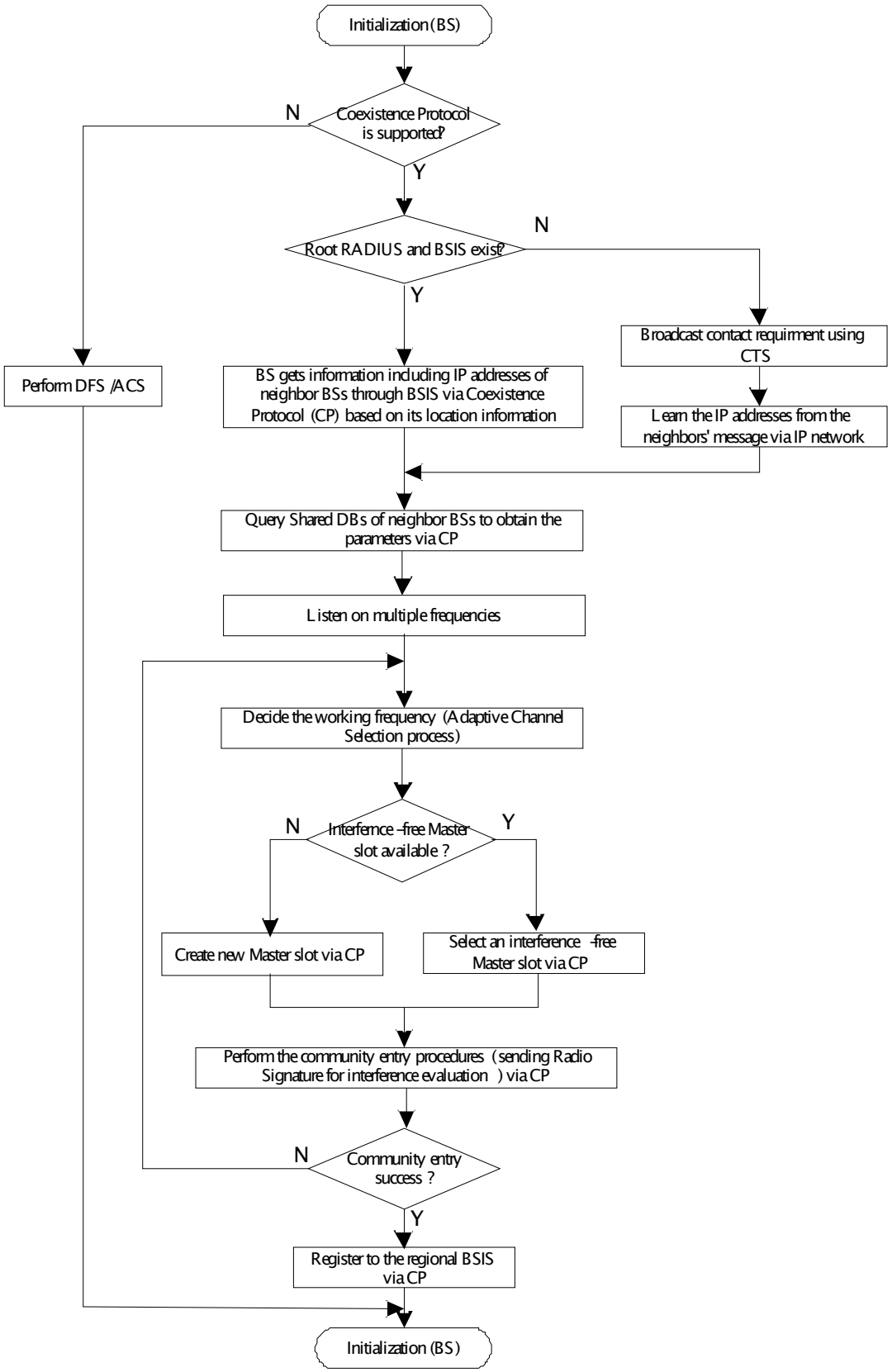

Figure 12. Initialization procedures — BS

[Change first paragraph of p.25 as following]

The first phase of the Community Entry is to judge the validity of country/region ~~database~~ Root RADIUS server. If the country/region ~~database~~ Root RADIUS server is valid, process ~~uses the country/region (FCC) data base~~ queries Root RADIUS server:

- Get the BSISs from the country/region Root RADIUS server;
- Read the ~~Regional/country~~ (FCC) data base maintained by BSIS via Coexistence Protocol;
- Identify which Base Stations might create interference, based on the location information;
- Learn the IP identifier for those Base Stations;

[Replace second paragraph of p.29 as following]

Local RADIUS server in Figure 14 acts as an authentication proxy of LE BSs registering to it and authenticates the requests of LE BSs relayed by foreign RADIUS servers from different networks. Local RADIUS also maintains the keying materials for establishing security association between BSs or between BSISs. Root RADIUS server is the registration center, the local RADIUS servers within certain country/region may register its IP address and country code. Thus, Root RADIUS server acts as key-role for local RADIUS server to find the RADIUS servers nearby.

[Change third paragraph of p.29 as following]

BSIS maintains the geographic and operational information such as latitude, longitude and the BSIDs of LE BSs within certain management domain. BSs operating under LE system shall first query the foreign BSISs which are geographically close to the local BSIS and find the neighbor BSs while starting up, following the Coexistence ~~Resolution and Negotiation (CRN)~~ Protocol (detailed description in section ~~x.x.x~~ 2.2.3). After the successful query procedure, the BS can obtain the BSIDs of the neighbor BSs. Intercommunication between BSs belonging to different networks is permitted after the BS acquires coexisting neighbor's ~~authentication key~~ Pairwise Master-key and ~~encryption key~~ PMK-index for ESP ~~as well as IP address by querying RADIUS server~~.

[Change 3.2.4.1 of p.34 as following]

The Base Station Identification Server (BSIS) acts as an interface between 802.16 LE BSs and the regional LE DB which stores the geographic and important operational information, e.g. latitudes, longitudes, BSIDs etc., of the LE BSs belonging to the same region. It converts the actions carried in PDUs received from the 802.16 LE BSs to the proper formats, e.g. SQL (Structured Query Language) string, and forwards the strings to the regional LE DB, which can be any available database software. BSIS converts the query results from the regional LE DB to the proper format, e.g. TLV encodings, and replies to the requested BSs. Figure14 shows the general architecture of inter-network communication across 802.16 LE systems. In this architecture, the 802.16 LE systems (BSs and BSISs) from different networks set up security association (including BS and BS, ~~BS~~ BSIS and BSIS) with each other by utilizing the services provided by the RADIUS server. BSIS acts as a peer of 802.16 LE BSs in this architecture~~, therefore, it also needs to register to the RADIUS server as the LE BSs do~~. ~~The MAC address of BSIS is well known among the LE operators. The LE BSs can use the MAC address of BSIS, which may be provisioned, to acquire the IP address and keys for Encapsulating Security Payload (ESP) (RFC2406:1998) operation of the BSIS by utilizing RADIUS protocol. As shown inFigure14, the RADIUS server maintains the BSID and IP mapping.~~ The BSID of regional BSIS is well known among the 802.16 LE systems within certain domain. In summary, ESP with RADIUS can discover a Rogue BS or BSIS. The

messages exchanged between the LE BSs and the BSIS will be revealed in the next section. Note that the interface between BSIS and regional LE DB is out of scope.

[Change Table 3 of p.40 as following]

Table 3—LE_CP message format

Syntax	Size	Notes
CP_Message_Format() {		
Version of protocol in use	4 bits	1 for current version
Management Message Type	8 bits	0 – LE_CP-REQ 1 – LE_CP-RSP
Code	8 bits	See Table 4
Length of Payload	16 bits	
Association ID	16 bits	
CP Message Seq_ID	8 bits	
Confirmation Code	8 bits	
Alignment	4 bits	
TLV Encoded Attributes	*variable*	TLV specific
}		

[Insert Table 4.1 before Table 4]

Table 4.1— Confirmation Code values

Confirmation Code	Status
0	OK/success
1	Reject-other
2	Reject-unrecognized-configuration-setting
3	Reject-unknow-action
4	Reject-authentication-failure
5-255	*Reserved*

[Change Table 4 as following]

Table 4—LE_CP message codes

	CP Message type	MAC Message Type	Protocol type	Direction
0	*reserved*	—	—	—
1	Identify Coexistence Request	LE_CP-REQ	TCP	BSIS->BSIS
2	Identify Coexistence Response	LE_CP-RSP	TCP	BSIS->BSIS
…	…	…	…	…
37-255	*reserved*	~~LE_CP-REQ~~	~~UDP~~	—

[Insert new entry to Table 5 as following]

Table 5—TLV types for CP payload

Type	Parameter Description
Tbc	Country Code
Tbc	Operator contact - phone
Tbc	Operator contact – E-mail
Tbc	PHY mode
Tbc	Maximum coverage at Max. power
Tbc	Current Tx power

[Replace section 6.1.1 as following]

6.1.1 Identify Coexistence Request message

The BSIS requests to the foreign BSIS with geographical information of the requesting LE BS.
Code: 1
Attributes are show in Table 9.1

Table 9.1—Identify Coexistence Request message attribute

Attribute	Contents
Operator identifier	The operator ID of the BSIS.
Country code	The country code of the BSIS
Latitude	The latitude information of the BS.
Longitude	The longitude information of the BS.
Altitude	The altitude information of the BS.
Maximum coverage at Max. power	The maximum radius at maximum allowed/designed power that the BS intends to detect its neighbors.

[Replace section 6.1.2 as following]

6.1.2 Identify Coexistence Reply message

The BSIS responds to the foreign BSIS to Identify Coexistence Request with a Identify Coexistence Reply message.
Code: 2
The query results is in the format of Neighbor Topology Parameter Set, each result will contain the attributes shown in Table 9.2. Each BSID TLV indicates start of new result.

Table 9.2—Neighbor Topology Parameter Set

Attribute	Contents
BSID	The BSID of the requested BS.
Operator identifier	The operator ID.
Operator contact - phone	The phone number in ASCII string of the operator.
Operator contact – E-mail	The E-mail address in ASCII string of the operator.
Country code	The country code of the BS
PHY mode	The PHY modes of the requested BS.
Latitude	The latitude information of the BS.
Longitude	The longitude information of the BS.
Altitude	The altitude information of the BS.
Maximum coverage at Max. power	The maximum radius at maximum allowed/designed power that the BS intends to detect its neighbors.

[Change 6.1.4 Neighbor Topology Request as following]

6.1.4 Neighbor Topology Reply message

The CIS responds to the BS' to Neighbor Topology Request with a Neighbor Topology Reply message.
Code: 4
~~**Query results of Neighbor Topology Encodings (see xx.xx)**~~
~~Specification of the query results of neighbor topology from BSIS specific parameters.~~
The query results is in the format of Neighbor Topology Parameter Set, each result will contain the attributes shown in Table 9. Each BSID TLV indicates start of new result.

Table 9.3—Neighbor Topology Parameter Set

Attribute	**Contents**
BSID	The BSID of the requested BS.
Operator identifier	The operator ID.
Operator contact - phone	The phone number in ASCII string of the operator.
Operator contact – E-mail	The E-mail address in ASCII string of the operator.
Country code	The country code of the BS
PHY mode	The PHY modes of the requested BS.
Latitude	The latitude information of the BS.
Longitude	The longitude information of the BS.
Altitude	The altitude information of the BS.
Maximum coverage at Max. power	The maximum radius at maximum allowed/designed power that the BS intends to detect its neighbors.

[Change Table 9 as following]

Table 9—Registration Request message attributes

Attribute	**Contents**
BSID	The BSID of the requested BS.
BS IP ~~[TBD]~~	The IP address of BS.
Operator identifier	The operator ID.
Operator contact - phone	The phone number in ASCII string of the operator.
Operator contact – E-mail	The E-mail address in ASCII string of the operator.
Country code	The country code of the BS
PHY mode	The PHY modes of the requested BS.
Latitude	The latitude information of the BS.
Longitude	The longitude information of the BS.
Altitude	The altitude information of the BS.
Maximum coverage at Max. power	The maximum radius at maximum allowed/designed power that the BS intends to detect its neighbors.

[Change Table 11 as following]

Table 11—Add Coexistence Neighbor Request message attributes

Attribute	**Contents**
BSID	The BSID of the requested BS.
BS IP	The IP address of requested BS.

Operator identifier	The operator ID.
Country code	The country code of the requested BS.
PHY mode	The PHY modes of the requested BS.
Latitude	The latitude information of the BS.
Longitude	The longitude information of the BS.
Altitude	The altitude information of the BS.
Current Tx power	Current Tx power of the BS.
Current operational radius	The current operational radius of the BS.
PHY specific parameters	The PHY specific encodings.

References

[1] IEEE 802.16h – 05/017 –Working Document for P802.16h, 2005-08-15