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Re:	LB 29, resolution of comment 111
Abstract	The document is a proposal for profiles based on the poll taken in November 2007 meeting, in relation with comment 092 in database IEEE 802.16/07-53r2
Purpose	[Description of what *specific* action is requested of the 802.16 Working Group or subgroup.]
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Synchronization between WirelessMAN-UCP and WirelessMAN-CX operation

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Introduction

In order to ensure that WirelessMAN-CX operation is not disturbed by WirelessMAN-UCP operation, a few clarifications related to the system synchronization and CXCC operation are required. These clarifications should be self-contained in proper clauses, which can be referred in Clause 12, profX_UC.

Note that disruption of WirelessMAM-UCP operation by WirelessMAN-CX systems has not yet been addressed and may need to be addressed in the future. This is for future study.

Text Changes to clause 15.2

15.2.1 Synchronization of ~~the~~ WirelessMAN-CX and WirelessMAN-UCP systems

15.2.1.0 Common Clock

All ~~the~~ base stations forming a community of users sharing a common radio spectrum ~~will~~ shall use a common clock to synchronize their MAC frames.
Such a clock can be provided by global navigational systems such as GPS or by a *Network Time Protocol* (NTP) server of sufficient accuracy to meet the requirements of section *Network* Time Interval and CX_MAC_NO Frame start. ~~or may be distributed by the Coexistence Control Channel.~~
Every BS, will as a first step upon activation, ensure the derivation of the common system clock.

WirelessMAN-CX ~~Systems~~systems, which do not ~~see~~ receive the signals of a global navigation system satellite or do not receive the appropriate information from a NTP Server, ~~will~~ may synchronize their BS with the operating WirelessMAN-CX systems, using the information distributed by CXCC. Such systems shall check their synchronization status at least every 10 minutes.
~~Synchronization with operating WirelessMAN-CX systems shall be accomplished either by use of synchronization distributed via the Coexistence Control Channel or through a *Network Time Protocol* (NTP) server of sufficient accuracy to meet the requirements of section *15.2.1.1*.~~

15.2.1.1 Network Time Interval and CX_MAC_NO Frame start

All synchronized WirelessMAN-CX base stations will derive a 1 pps clock broadcast by a global navigational system or other means. The 1 sec duration is called the Network Time Interval (NTI). The rising edge of the 1 pps synchronization pulse will be considered as the start of the NTI and of the WirelessMAN-CX MAC Frame. The 1pps pulse will have a stability of +/-50 nanoseconds, as measured from rising edge to rising edge. The beginning of every Coexistence Control cycle CX_MAC_NO 1 will always start at every tenth NTI.

Granularity of the NTI
The NTI will be comprised of 1000 1 Millisecond slots called NTI_S units. NTI_S units can be determined internally by the BS or SS, being derived from the NTI. NTI_S units can alternatively be supplied directly to the BS or SS by the global navigational system receivers used to determine the NTI.

15.2.1.3 UTC Standard Time

The common clock specified in section Network Time Interval and CX_MAC_NO Frame start will provide a Universal Coordinated Time (UTC) signal to all WirelessMAN-CX systems, making all systems synchronized to this referenced time stamp. WirelessMAN-CX base stations will use the UTC time standard for coordinating and identifying specific NTI intervals. One millisecond granularity of the UTC Standard Time will be provided by specifying the NTI_S units.

15.2.1.4 UTC Time Stamp Word

The WirelessMAN-CX will time stamp coexistence protocol events using a 4 bytes Universal Time Stamp (UTC_TS). The composition of this word and the derivation of its contents will be as specified in *Composition of* UTC_TS.

Table h11—Composition of UTC_TS

Bit Numbers	Value (decimal)	Origin of Value
0-4 (MSB)	1-31 (days)	Derived from universal timing standard system
5-9	1-24 (hours)	
10-15	1-60 (minutes)	
16-21	1-60 (seconds) NTI	
22- 31 (LSB)	1-1000 (milliseconds) NTI_S	Derived internally at BS or SS or taken from universal timing standard system if available

Table h11—

15.2.1.5 Transmit / Receive synchronization

In order to achieve the co-location of different access networks it is necessary to use the same MAC Frame duration, and the same DL/UL splitting.
The MAC Frame durations are defined for the specific Regulatory domains in section 15.7

In the LE or non-exclusively assigned Regulatory domains, the DL/UL splitting in TDD operation will be set for compliant systems to be 60%/40%.

Changes to clause 15.3.1

15.3.1 Coexistence Control Channel

As described in 15.1.4.3, the Coexistence Control Channel (CXCC) is based on a series of globally synchronized time-slots, each of duration of Tcc_s allocated at periods of Tcc (see 10.5.2) dedicated for coexistence functions. It uses about 1% of system resources. It is scheduled such that the CXCC time slots occur alternately during a DL and UL sub-frames, and.

15.3.1.1 Basic principles

The CXCC allocation usage will follow the following rules:

- The CXCC allocations are mapped to Master and Shared sub-frames.
- During the CXCC allocations, no Slave or Shared activity is allowed; however, depending of context, the Master sub-frames may be used for transmitting regular data. The optional common sub-frame preceding a Slave within a CXCC allocation will not be transmitted.
- The timing of the CXCC allocation, relative to the MAC Frame, is given in clause 10.5.2.
- The timing of the CSI allocation is given in 10.5.3.
- CX_MAC Frame numbering is binary having the length of 10bits; the CX_MAC_Frame = 0 is synchronized with the absolute time 00:00:00 UTC. CX_MAC_NO is incremented by 1 every MAC Frame.
- The repetition period of CXCC (T*cxcc*, see 10.5.2) for 5ms MAC Frames is 5.12s (1024 MAC Frames). Four CXCC cycles constitute a CXCC Multi-Frame.
- A CXCC sub-channel is formed from eight CXCC allocations, mapped within Master and Shared sub-frames,four for the DL and four for the UL.
- The CXCC four sub-channels are scheduled in consecutive order.
- The duration of a CXCC sub-channel is:
  - 1024 / 4 = 256 MAC frames (1280 ms)
  - The CXCC allocations appear in average every 256/4 = 64 MAC Frames (320ms).
- The CXCC allocations during any one of CXCC sub-channel 1-4 are:
  - Master allocation 1: CX_MAC_NO mod 256 = 0
  - Master allocation 2: CX_MAC_NO mod 256 = 64+1
  - Master allocation 3: CX_MAC_NO mod 256 = 128+2
  - Shared allocation: CX_MAC_NO mod 256 = 192+3
- The CXCC allocations during CSI sub-channel is:
  - OCSI for the system with Master allocation 1: CX_MAC_NO mod 4 = 0

- OCSI for the system with Master allocation 2: CX_MAC_NO mod 4 = 1
- OCSI for the system with Master allocation 3: CX_MAC_NO mod 4 = 2
- ICSI for the initialization system: CX_MAC_NO mod 4 = 3

15.3.1.1.0 Operation of other WirelessMAN system variants during the CXCC.

Other variants of WirelessMAN systems operating in the same geographic region and spectrum as a WirelessMAN-CX system shall be silent during the time intervals allocated for the operation of the CXCC sub-channels 1-3. Note that this requires the capability to synchronize sufficiently (see section 15.2.1) to determine which frames constitute the CXCC.

Changes to clause 12

12.5.1.1 ProfX_UC: Uncoordinated coexistence profile features

This profile specifies a set of capability requirements when a system is operating in the Uncoordinated coexistence mode. *Feature requirements* profX_UC lists the optional features and designates whether they shall or may be implemented to comply with this profile.

Table h4—Feature requirements profX_UC

Feature	Reference	Required?	Conditions/Notes
Coexistence with SSU	6.4.1.2	Conditional	Local regulatory
DCS	*6.4.1.3.2*	Yes	
Frame Selection	*6.4.1.3.3*	Yes	
LBT with DMA	*6.4.1.3.4*	Yes	
Synchronization ~~to Neighbor system~~	15.2.1.0 15.2.1.5	~~Conditional~~ Yes	~~TDD~~
Silence during CXCC operation	15.3.1.1.0	Yes	