Project	**IEEE 802.16 Broadband Wireless Access Working Group**
Title	**IEEE 802.16.1 MAC Task Group Meeting Minutes for Session #7.5**
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Re:	This contribution is to provide the minutes of the 802.16.1 MAC task group for Session #7.5.
Abstract	802.16.1 Session #7.5 MAC task group minutes.
Purpose	
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IEEE 802.16 MAC Task Group Meeting Minutes for Session #7.5

Acting Secretary: Juan-Carlos Zuniga
Harris Corporation

Session # 7.5

Tuesday, **May 30, 2000**

Time	Speaker	Discussion
1530	Carl Eklund	Call to order.
	Carl Eklund	Beginning the MAC discussion by agreeing upon a protocol model.
	Jay Klein	Convergence layer processed should be described in individual chapters or appendices, so that they can be updated by addenda.
	Carl Eklund, Glen Sater, Jim Mollenauer, Ken Stanwood.	All the parameters related to the connections have to be addressed. We should try to concentrate in the purpose of using a SAP, whether it will be in a per service fashion or per convergence layer. When the time arrives for defining these SAPs, we should try to make them as broad as possible so that we leave room for future protocols to be handled. The addressing mechanism should have parameters with protocol independent SAP. Agreement. TLVs should be used for higher level SAP. There should be a set of default SAP parameters. MAC control messages should be self-contained and independent of higher levels.
	Carl Eklund	Proposal to have 2 types of messages, the first ones related to low level (PHY) configuration, and the others related to higher layers (how to handle connections).
	Glen Sater	Will think about the implications.
	Group	There is consensus that Encryption should happen in between the MAC and the TC layer. A privacy layer will be depicted within the MAC layer in the border point with the TC.

Group discussion:

Defining the common MAC SAP primitives and their parameters.
(Down = Upper sublayer to MAC, Up = MAC to Upper sublayer)

MAC_DATA.req(down)/ind(up)

- CID,
- length,
- PDU
- Discard Eligible flag

MAC_CREATE_SF.req(down)
The issue of providing the CID from the Convergence to the MAC, or to have it as a response only from the MAC is still to be defined. If no CID is provided, a seq # is required in order to correlate messages (i.e. req vs. rsp).

- CID?. = NO

- Traffic desc.,
- QoS param,
- seq #

MAC_CREATE_SF.rsp(up)
The issue of whether the rsp message will be followed by a conf message (Convergence layer rejecting the connection instead of MAC) is still to be defined

- CID,
- ResponseCode,
- ResponseMessage (TLV),
- seq #

MAC_CREATE_SF.ind(up)

MAC_CREATE_SF.conf(up) ???

The primitives will be revisited at a later time based on the D+ and verifying that the existing ones are sufficient.

17:30		Discussion about if the CRC is needed for the header or not, and whether the header is going to be fixed or it will be variable in length was raised.
	Phil Guillemette	A variable header with known choices is easy to implement in hardware (i.e. flags for encryption and fragmentation).
	Carl Eklund	IPv6 example, where even though different information is carried in the headers, the basic header is fixed in length.
	Jay Klein	The header will be fixed, although the length still has to be defined so that it supports all the different flavours.
	Juan-Carlos Zuniga	The SAP should take care of the discard-eligible information, but this information does not have to be transmitted over the Air through the MAC header (discard bit). The issue will be passed later on when the SAP gets defined.
19:00	John Liebetreu	Should we continue until late or are we finishing the discussion soon?
	Ken Stanwood	The queue depth issue and the UGS must be addressed the sooner the better for the sake of the members that will leave earlier.

Group discussion:

PDU over the Air Core parameters:

- CID (16 bits)
  - Review the case of granting BW per terminal vs. granting it per connection
- Length (approx.11)
  - 2K Ethernet packet max.
- BW Request / PDU Flag to notify type of message (1 bit)
- Encryption
  - Key sequence cycle (4 bits)
  - On/Off flag (1 bit)
  - Even/Odd (perhaps 1 bit part of the sequence cycle?)
- Header protection (8 for short fixed / 16 if larger) TBD
- Fragmentation (6 bits)
  - Begin/Cont./End (2 bits)

- Sequence # (4 bits). This is needed if the CRC is applied at the TC, whereas if the CRC is applied at the MAC or Convergence layer (whole PDU) then the parameter is not needed.

19:35	Carl	Adjournment of session

Wednesday, **May 31, 2000**

8:10	Carl Eklund	Call to Order
	Carl Eklund	Carl asks Glen whether he got any resolution on the pending Monday issues.
	Carl Eklund, Glen Sater	Should the requests for bandwidth be made in a per connection or per terminal basis?.
9:00	Ken, Glen, Carl, Jim, Phil, Yair, Sergio, Juan-Carlos.	Discussion on whether the grants should be per terminal or per connection was taking off-line.

Requests should be made in a per connection basis, whereas grants should be given in a per terminal basis.
The terminal should flag to the base station whether it is capable of handling this feature or not.
Header suppression left up to the convergence layer, since it is dependent on the service type.
Power control bit is taken off the core header, since being a non-deterministic way of controlling power, it requires the use of power control messages anyway.

Glen's concerns regarding the CPE allocation

- Fragmentation
  - BS initiates by granting BW
  - Control in terminal
  - Multiple connections – how is this handled?
- Piggy-back requests
  - Last part of the message
  - Additional BW for concatenation
  - Memory in BS for fragmentation
- Active Grants / UGS Activity detection
  - Extended Header indicates # of grants per interval
  - CBR type service may jitter
- RT-polling / nRT polling / poll-me bit
- Acks /lost MAPs
  - How are Acks handled

Group discussion:

Definition:
GPT – Grants per Terminal mode
GPC – Grants per Connection mode

For a hybrid approach:
BS to support both modes

RS to support either of them by registration

Main Rules:
- Full connection ID to be used
- Requests should be made by connection always
- Common structure should be supported by the two modes
- Terminals in GPT will receive grants for the "basic" CID:
  - In the terminal, BW will be allocated to individual connections in accordance to terminal's scheduling algorithm.
  - The scheduling algorithm must comply with the agreed QoS parameters for the connections.
- Terminals in GPC will receive grants for the specific CID

Structure of the MAP message:
Should it be in a per symbol basis or in a per byte?. It has to be in a per tic unit, which is related to the symbol and allows for dynamic modulation.
- CID (14-16 bits)
- Length of the grant in tick units is provided as an Offset from the previous grant (12 bits).
  - The first one has a zero offset
  - Length is known by looking at the next grant.
  - Null grant is required at the end
- The Tick length should be a programmable system wide parameter advertised by the BS, as a multiple of 4 symbols.
- Burst type ??? (4 bits)
  - Data, ranging, etc.

Requests are going to be in byte related units.

12:45		Break for lunch
13:15	Carl Eklund	Meeting reconvened
	Group	Burst types to be supported: Start from revising the ones specified in the D+ proposal. Should the US MAP be the same for the DS (H-FDD, TDD cases)?
	Ken Stanwood	3 kinds of PHY have to be supported: ▪ Mode A MAP is not required for the DS, since modulation is always constant within the carrier. ▪ Mode B H-FDD MAP can be the same used for the Mode A US ▪ Mode B TDD can have a simpler DS MAP structure with 3 x 16-bit pointers
	Carl Eklund	Revisiting Glen's issues
	Glen Sater	D+ proposal requires the piggyback request to be only for the remaining of the packet and no for the next incoming packet that potentially may exist. This latter packet would require to be allocated through a piggyback request in the last fragment of the original packet.
	Carl Eklund	Piggyback requests are treated in two ways, if they are referred to the same CID then it will be few bits (8?) included in the header. On the other hand, if the need for BW is for another CID then an extra message (6 bytes) should be used instead.

	Ken Stanwood	The 8 bits for piggyback can potentially be used for the queue depth in CBR connections. In the DS can be left for future applications.

PDU over the Air Core parameters (cont.):

- Grant Interval Management (8 bits)
  - CBR
    - Poll-me bit (1 bit)
    - Queue depth indicator (slip buffer indicator) (1 bit)
  - Unsolicited Grant with Activity Detection
    - Queue depth indicator (1 bit)
    - Dynamic Grant per interval (7 bits)
  - DAMA
    - Piggyback request (8 bits)

	Carl Eklund	Services supported by the system are: CBR, UGS/AD, RT-Polling, nRT-Polling and Best-effort.
16:30	Group	MAC management messages:
		Higher layer management messages are put in a separate CID ("basic CID"), which is a lower priority than CBR services. Who is responsible for generating the CID?, the convergence layer or the MAC?. Provisioning, admittance and activation of services are envisioned.
		The CID first appears in the BS in response to the response to admit the connection, which can come from either the BS or CPE.
		SAP will include a Master clock primitive to propagate the BS clock to the higher layer entities at the CPEs
		Registration and authentication. Using a 48 bit unique address or the EUI 64 bit address (proposed now by the same people that created the 48 bit). 64 will be used at registration time.
		Frame and synchronisation definition. Frame has a different meaning in both proposals. Since the Mode B requires this parameter, it must be clearly specified
		Jitter. Should the standard reflect a boundary for jitter?. Potentially the parameter will be different for CBR services, RT VBR, etc. If the network requires a smaller jitter than the one introduced by the MAC, then jitter buffers must be implemented at higher layers in order to translate jitter into delay (latency). 2 ms is proposed as the minimum jitter and it will be left for future approval.
		Ranging intervals ? CRC ?

18:00		Adjournment of session

Thursday, **June 1, 2000**

7:10	Carl Eklund	Call to Order
	Glen Sater	What is the purpose of the Poll-me bit? Is this really needed or is just a redundant information not coherent with the scheduling?
	Ken Stanwood	The Poll-me bit is used when a Terminal with a sufficient rate CBR connection already established needs to let the BS know that it requires BW for a different connection.

Group discussion:

Scheduling services:

- UG Service (UG)
- UG with Activity Detection
- RT Polling
- nRT Polling
- Best-effort (contention based)

Poll-me bit definition:

- GPC
  - Not used
  - Issue: "Terminal" concept to be developed in GPC mode, so that different connections can be associated to a single Terminal
- GPT
  - Only used for a Terminal (with a sufficient rate UG connection) to request to be polled
  - Standard poll messaging by BS

Details need to be worked out in both modes.

	Glen Sater	It is not consistent the use of the Poll-me bit. It requires some complexity in the scheduling algorithm, since it requires it to function in a per terminal basis and not in a per connection basis.
8:30		An inconsistency was found on the concepts of RT and nRT services for the two groups. For Glen the RT-polling requires a fixed polling interval to be defined, whereas the nRT-polling allows the polling interval to vary depending on the activity. This latter concept applies for both RT and nRT-polling for Ken. In this case, the difference between RT and nRT-polling resides on the interval and QoS parameters negotiated at registration.
	Ken Stanwood	Do we want to standardise the polling interval, or can we leave it open by stating that fairness has to be implemented, similarly to what the scheduling and CAC have to provide.
		There is agreement on the nRT-Polling concept. Glen requested to revisit the RT-Polling concept later. Ken remarked the big implication that the "polling per connection vs. polling per terminal" concept will have.

	Glen Sater	There are still details that have to be worked out for the concept of the poll-me bit in both GPT and GPC modes.
	Jay Klein	Definition of the Burst profiles with the help of Jeff. The concept of D+ is good, since a single burst message defines or modifies a burst. Also, the capability of defining that burst with only a reference number is helpful.
	Group	The concept for burst profiling will be similar to the one used in the D+ proposal. Parameters need to be revisited when the new FEC is chosen.
	Jay Klein	Should the number of US channels filed (1 byte) be shortened for this application?. Even though the 256-channels is unrealistic, the MAC should give enough flexibility to the PHY to choose whatever scheme they want.
	Glen Sater	DOCSIS is presently addressing the issue of making the UCC fast enough (ms) so that phone calls are not dropped. The CPE is instructed to only change US at a specific symbol time and keep on maintaining even the synchronization, or to re-register completely in the new channel.

Group discussion:

Frame definition.

- "Frame" is a PHY related parameter
- "Scheduling interval" is a MAC related parameter

Time stamp
- The MAP is at the "scheduling interval" start and referenced to a PHY related time base.
- In Mode B PHY, the frame concept provides the time base

	Ken Stanwood	Policing is included in the D+ proposal. The concept of policing should be applied before the data arrives to the MAC, and this latter should only be responsible for providing QoS.
	Ken Stanwood	Power control. To take off the phrase in parenthesis in the last bullet of section 5.4.2.5 of the D+ proposal: "without a response from the BS".
	Glen Sater	Ranging interval and messages.
	Ken Stanwood	The Terminal should tell the BS whether the modulation can be changed, although the BS has the authority to accept or not such change.

Group discussion:

Glen. Issues to be solved:
- Policing
  - = It is not a MAC issue
- Power control
  - There is a need for a mechanism to notify the BS when the terminal reaches min/max power level in the ranging process.
- Ranging intervals
- Adaptive modulation

10:00		Break
10:15	Ken Stanwood	Is the Temporary SID required?
		Depends on the number of Stations envisioned in the system

Group discussion:

General Issues

- Registration / Ranging
  - Initial ranging as per D+
    - Reg. Sequence & general format and content of the messages
- Sync message
  - in D+: similar concept in the E+ that defines a time reference.
  - Same structure must be used for both PHY Modes.
- Encryption & Authentication
  - Key exchange in US and DS as per D+
  - Investigate strength of different modes (CBC/counter), key sequencing mechanism (even/odd bit), root certificate authority and validity, counter availability for PHY Mode A.
- Dynamic service messages
  - D+ concept = OK
- Define Convergence sub-layers for ATM, IP and Ethernet
- Contention resolution
  - Binary exponential back-off
- Baseline for registration.
  - Single registration event per interval (D+)
  - Examine the sliding window (multi-registration events per window).
    - Modelling will solve this issue
    - Sliding window concept requires a different message structure to reflect reference timing point.

Investigate global denial certificates: how are they going to be managed and handled.
Key sequencing message is required only if the E+ approach is taken. The D+ approach provides this information differently.
Issue: Are certificates going to be imposed to the standard for North American or for world-wide systems?

PDU over the Air Core parameters (cont.):

- BW Request / PDU Flag to notify type of message (1 bit)

CRC ?

11:50		Carl and Juan-Carlos to clean the list of agreements and generate a call for contributions out of it.
12:00		Lunch break
13:15		Group reconvened
	Group	Discussion to make sure that all the agreements of the group are reflected in the call for contributions
14:10	**Motion: Glen Sater, seconded by Jay Klein**	**To accept the present invitation to contribute**

	Roger Marks	To correct and update the list of invitees to contribute
	Phil Guillemette	Is a quorum required to accept a call for contributions?
	Roger Marks	Task groups have no quorum as such
	Roger Marks	To put after the statement "following requirements" to "give an explanation about why the requirements were not followed". Not accepted
	Glen Sater	To merge second bullet into the first one. Accepted.
	Vote on Motion to approve Call for Contributions	**Unanimous consent (14 present)**
15:00		Break
15:15		MAC Modelling session
		No contribution (but one) was received for MAC modelling. The purpose of the modelling is not a comparison but rather an evaluation.
	Jeff Foerster	Should a third party carry out the simulation?
	Roger Marks	Opnet may provide a common framework to be used for somebody else that wants to build the MAC model based on this platform.
	Roger Marks	NIST Gaithersburg volunteered for validating and running the simulations, although the code must be provided to them.
	Phil Guillemette	To contact the University of Sheffield and Opnet Tech. for gathering information.
	Group	The guidelines for the MAC simulation must be specified so that the expected results are well bounded.
		A MAC editorial team and a MAC validation (simulation) team should be formed.
		The validation team will be formed in session 8.
	Phil Guillemette	To confirm with the Opnet people how long it will take to build a MAC model.
16:10	Carl Eklund	MAC modelling session adjourned.

Friday, **June 2, 2000**

8:00	Roger Marks	Call to Order
		Explanation of Tutorial for session 8
		Discussion on editing process for PHY and MAC
10:30	Roger Marks	Session adjourned