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Re:	Call for Contributions on Requirements for P802.16m , 01/30/07
Abstract	This contribution provides the functional requirements of advanced air interface for the 802.16m. In order to specify and realize the ultimate goals that should be met by the IEEE 802.16m as the next generation mobile networks, this contribution propose the specific requirements including latency, QoS, radio resource management, and security.
Purpose	For discussion and approval by TGm
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Section 6-Functional Requirements for IEEE 802.16m

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01. Background

IEEE P802.16m shall provide an advanced air interface to meet the requirements of next generation mobile networks. For this, the contribution provides the details of functional requirements for IEEE 802.16m, and it covers the section 6.2 Latency, 6.3 QoS, 6.4 Radio Resource Management, and 6.5 Security specified by Draft IEEE 802.16m Requirements [1].

6.2 Latency

It's important to minimize the latency for all aspects of the system including air link delay, state transition delay, access delay, and handover delay to guarantee QoS of IMT-Advanced services in IEEE 802.16m.

IMT-Advanced service classes are divided into 4 classes such as Conversational, Interactive, Streaming, and Background services. IMT-Advanced multimedia services are categorized into several multimedia service types with different minimum requirements. The considered multimedia classes for IMT-Advanced system are as follows [9]:

- *Low Multimedia*: The data speed of the service reaches up to 144 kbit/s. Services include e.g. VoIP, video telephony and file sharing
- *Medium multimedia*: The data speed of the service reaches up to 2 Mbit/s. Services include e.g. video conference, mobile TV, broadcast IP TV, video/audio streaming, photo messages and business intranet/extranet.
- *High multimedia*: The data speed of the service reaches up to 30 Mbit/s. Services include e.g. high quality video conference, video streaming and messaging, application sharing, mobile internet/intranet/extranet and navigation.
- *Super high multimedia*: The data speed of the service reaches up to 100 Mbit/s or even 1 Gbit/s. Services include e.g. high volume streaming, e-newspaper and game data download, and mobile internet/intranet/extranet.

Detailed QoS parameters for IMT –Advanced services have not been decided in ITU-R. It is anticipated that required QoS parameters would be similar to or better than current QoS requirements of 3GPP. Referring to 3GPP TS 22.105 [8], the required delay for audio or video services should be less than 150msec and the required delay for real-time game should be less than 75msec.

Based on the available information, text proposal in Section 2 for latency shall be satisfied for IMT-Advanced services.

6.3 QoS

As identified in ITU-R M.1645 [2] and recent related document [5] [6], IEEE 802.16m shall support

great flexible resource distribution mechanism for supporting a wide range of services [9] (listed in the previous clause 6.2) simultaneously.

6.4 Radio Resource Management

The IEEE 802.16m shall be designed to be flexible and efficient. The IEEE 802.16m system should allow scalable channel allocation for giving high system flexibility. And also, the IEEE 802.16m system should support dynamic resource management among cells for efficient resource management.

6.5 Security

Regarding the security for IEEE 802.16m, the balance between security and performance shall be considered to meet the requirement of IMT-Advanced system recommended by M.1645. The security features of IEEE 802.16m inherit that of PKM layer of legacy system and improve it. That is, the design goal of IEEE 802.16m security shall focus on the improvement of security of legacy 802.16 systems and reduce its cost.

0 2. Proposed text change

[Change the text of 80216m-07_002[1] as follows]

0*6.2 Latency*

IEEE 802.16m system shall support a considerably reduced latency for signaling or user traffics compared to the IEEE 802.16e system, considering the following latencies:

1) Latency for transition from Power saving mode to normal mode
- Idle Mode transition latency: Transition delay from Idle Mode to when MS starts exchanging data with BS.
- Sleep Mode transition latency: Transition delay until MS wakes up from sleep mode.

2) Data transmission latency: Delay between the start of a data packet at IP layer of MS/BS and the arrival of the data packet at IP layer of BS/MS.
3) Handover latency: Delay from when MS break the current connection with Serving BS to when the MS make a new connection with target BS.

1*6.3 QoS Requirement*

IEEE 802.16m shall provide optimal and stable resource allocation mechanism to support QoS for IMT-Advanced service classes, Conversational, Interactive, Streaming, and Background services. IEEE 802.16m shall also provide QoS mechanism for low multimedia, medium multimedia, high multimedia, and high multimedia. Their definitions are given below.

- *Low Multimedia*: The data speed of the service reaches up to 144 kbit/s. Services include e.g. VoIP, video telephony and file sharing
- *Medium multimedia*: The data speed of the service reaches up to 2 Mbit/s. Services include e.g. video conference, mobile TV, broadcast IP TV, video/audio streaming, photo messages and business intranet/extranet.
- *High multimedia*: The data speed of the service reaches up to 30 Mbit/s. Services include e.g.

high quality video conference, video streaming and messaging, application sharing, mobile internet/intranet/extranet and navigation.

- *Super high multimedia*: The data speed of the service reaches up to 100 Mbit/s or even 1 Gbit/s. Services include e.g. high volume streaming, e-newspaper and game data download, and mobile internet/intranet/extranet.

Quality of Service profiles for IMT-Advanced and the future development of IMT-2000 are given in the Table 1.

Table 1
Quality of Service profiles for IMT-Advanced and the future development of IMT-2000

Traffic class / Service type	Conversational	Streaming	Interactive	Background
Super High Multimedia (30Mbit/s to 100M/1Gbit/s)	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD
High multimedia (<30 Mbit/s)	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD
Medium multimedia (<2 Mbit/s)	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD
Multimedia & Low rate data (<144kbit/s)	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD
Very low bit rate (<16kbit/s)	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD	Layer 2 throughput: TBD Delay: TBD Delay jitter: TBD Asymmetry: TBD

Note) QoS parameters in the table are expected to be defined by ITU-R. (IMT.SERV)

2*6.4 Radio Resource Management*

The 802.16m system shall provide more efficient radio resource allocation mechanism than the 802.16e system. The IEEE 802.16m system capacity should be scalable enough to be expandable easily.

The IEEE 802.16m shall provide radio resource management mechanism to support prioritized system access including emergency service.

3*6.5 Security*

The security sublayer currently defined in IEEE 802.16 provides the function of authentication, confidentiality and integrity. In the design of IEEE 802.16m, optimizations and enhancements for the security of legacy IEEE 802.16e system shall be further highlighted. For this, the security for IEEE 802.16m shall satisfy the followings.

1) Support delay constrained handover/roaming : Seamless mobility shall be ensured without changing the security level. For this, security mechanisms/algorithms shall be negotiated across heterogeneous networks.

2) Reduce cost and complexity : The EAP intrinsic complexity, message size overhead, many round trips and high end-to-end packet transmission delay shall be minimized. For this, new security services shall be offered without degrading the performance and capacity

3) Enhance security : The security flaws of 802.16 shall be resolved in a cost effective way at MAC layer. For this, new cryptographic methods shall be used to treat various attacks on MAC messages. Also, more robust and enhanced function of confidentiality/integrity protection shall be considered.

3. References

[1] IEEE 802.16m-07_002 Draft IEEE 802.16m Requirements, January 2007
[2] Recommendation ITU-R M.1645 Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000, January 2003.
[3] Recommendation ITU-R M.1034-1 Requirements for the Radio Interface(s) for international mobile telecommunications-2000(IMT-2000), 1997
[4] Recommendation ITU-T F.115 Service objectives and principles for Future Public Land Mobile Telecommunication Systems, February 1995

[5] ITU-R Document 8F/TEMP/496-E: Draft [Report on] Requirements Related to Technical System Performance for IMT-Advanced Radio Interface(s), January 2007.

[6] IEEE C802.16m-07/007: IEEE 802.16m Requirements, LG Electronics, January 2007.

[7] ITU-R Document 8F/TEMP/363: Summary of Spectrum Usage Survey Results for WRC-07 Agenda Item 1.4, February 2006

[8] 3GPP TS 22.105 V8.2.0, Services and service capabilities

[9] ITU-R Document: Service Recommendation [IMT.SERV], February 2007.