Response to Comments from 802.16

Roger,

Thank you for your review of our PAR and your comments. Our reply follows:

(1)We are concerned that the MBWA PAR has distinctly limited broad market potential because it is promoting a solution to directly compete with systems already developed or under development by worldwide partnerships of large, broadly supported Standards development Organizations operating in coordination with the ITU. We understand that there is some argument that the MBWA PAR could lead to a more efficient data solution, but the market potential is limited nevertheless.

Uniqueness of MBWA against 3G

In our view, the market potential for MBWA systems is extremely broad because it targets IP-based mobile data applications which are more closely associated with Internet access via laptops, PDAs, and digital cameras as opposed to data-enabled cell phones. The market projections show that the laptop market is expected to quadruple in the next 2-3 years to more than $3B (Goldman Report 2002).

As noted in the "uniqueness" session, the charters of the 3G projects (3GPP/3GPP2) are limited to the evolution of existing GSM and ANSI-41 based networks. These projects are currently working toward evolving those voice and data networks towards an IP network.

The ITU-R Working Party 8F recently adopted a draft new recommendation (DNR), "Vision, framework and overall objectives of the future development of IMT-2000 (3G) and systems beyond IMT-2000 (beyond 3G)," which states that:

"Section 4.2.5 – New capabilities for systems beyond IMT-2000

> *… It is therefore anticipated that there will be a requirement for a new radio access technology or technologies at some point in the future to satisfy the anticipated demands for higher bandwidth services."*

and additionally, that

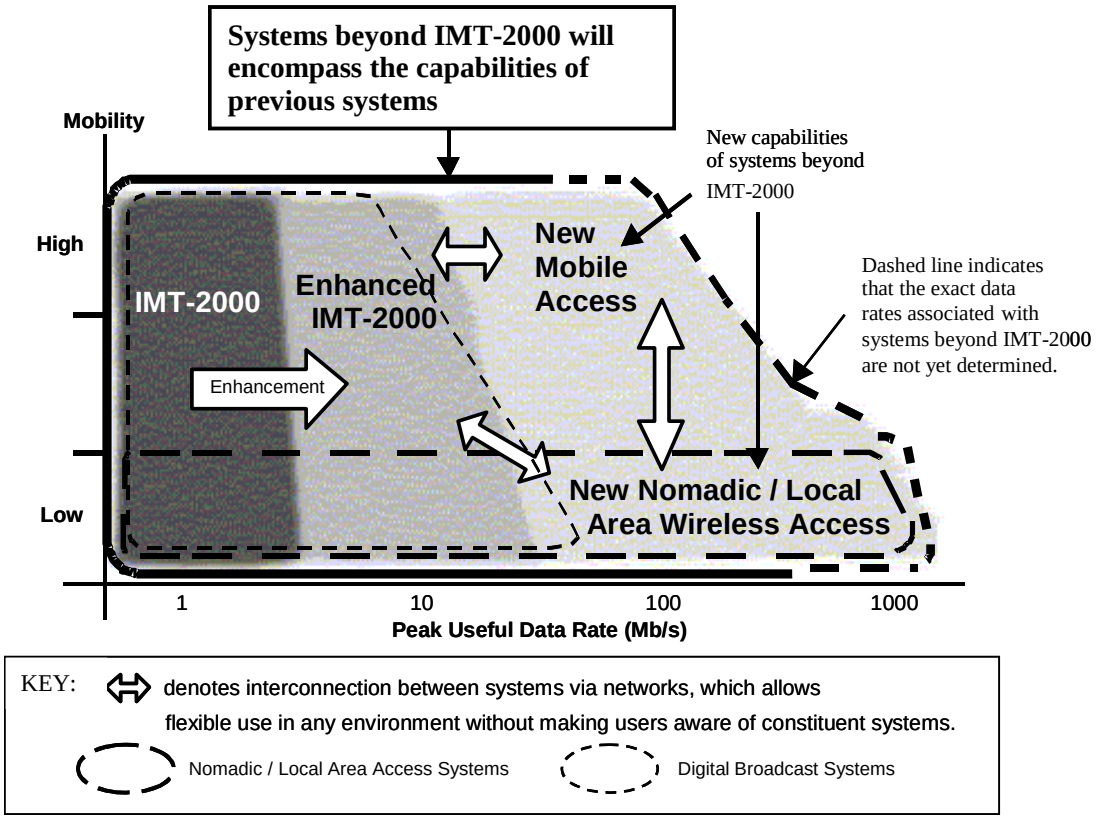
> "The technologies, applications and services associated with systems beyond IMT-2000 could well be radically different from the present, challenging the perceptions of what may be considered viable by today's standards and going beyond what can be achieved by the future enhancement of IMT-2000 working with other radio systems."

In our view, the target for the MBWA project is described by the ITU-R Working Party 8F as "systems beyond IMT-2000," which is not being addressed in any project within

any existing standards development organization. It was also noted in the Working Party 8F's Vision recommendation that:

> **"Section 4.2.1 – High Level Vision**
> In conjunction with the future development of IMT-2000 and systems beyond IMT-2000, relationships will continue to develop between different radio access and communications systems, for example wireless PANs, LANs, digital broadcast, and fixed wireless access."

MBWA targets capabilities for "systems beyond IMT-2000," which is shown in the Figure 4-2 from WP8F's Vision recommendation (see below).



Dark shading indicates existing capabilities, medium shading indicates enhancements to IMT-2000, and the lighter shading indicates new capabilities of systems beyond IMT-2000.

The degree of mobility as used in this figure is described as follows: Low mobility covers pedestrian speed, and high mobility covers high speed on highways or fast trains (60 km/h to ~250 km/h, or more).

(2)We have heard from many corners that the MBWA PAR is not sufficiently distinct from the 802.16e PAR. If the difference between these two PARs is

viewed as too small, then the difference between the MBWA proposal and the pre-existing mobile projects must certainly be too small to be considered distinct.

We agree that the 802.16e PAR as drafted in Cheju was not distinct from the pre-existing MBWA PAR. As explained previously, we believe that both the 802.16e and MBWA ECSG PAR define projects that are different from projects currently in the scope of existing mobile projects. This is another aspect in which both PARs are on the same footing.

(3) The proposed name of the Working Group (“IEEE 802.20 Working Group on Mobile Broadband Wireless Access ”) would introduce significant confusion if entered into the 802 panoply, given the current existence of the “Working Group on Broadband Wireless Access.”

It has been the policy of the IEEE to choose working group names that reflect the work done in the committee. We note that there have been other groups with similar names. For example, "802.4 Token Bus Working Group" and "802.5 Token Ring Working Group" are similar and this is not known to have caused any problem in the past.

(4)The “Expected Date of Submission for Initial Sponsor Ballot ” ((2004-05-26) is too optimistic for the following reasons:

a) As a “clean slate ” project, it is unrealistic to expect completion in less than three years, which is more typical of extension projects. IEEE 802 experience indicates that new projects from newly created Working Groups typically require at least three to four years.

The MBWA project is clean slate but as stated in the “Technical Feasibility” part of the Five Criteria we expect contributions that are based on well understood technologies (see the “MBWA Five Criteria”) that are already in use in mobile environments. There are, therefore, no technological barriers in developing the standard. We, therefore, believe that the timeline, though ambitious is achievable. The goal is to establish a Working Group that works as team toward a common objective to satisfy the market needs identified in the Five Criteria.

b) Because of the significant overlap of this potential project with large, pre-existing standardization efforts, a very close liaison with these groups will be required. This will involve exchanges of documents for coordination and review. Since these groups operate under their own schedules, this can cause significant delays in the Standards development process.

The MBWA project focuses on a new air-interface standard and much of this work is independent of any existing work in other SDOs. Just like for any other projects involving mobility, cooperation with other SDOs will be required to

facilitate interworking. We expect this to proceed expeditiously without endangering the timeline.

c) Because of the significant overlap of this potential project with large, pre-existing standardization efforts, we fear that large numbers of participants from those projects would enter the 802 process with the express purposes of moving it toward their existing outside solutions. This could result in virtual gridlock that could take many years to resolve.

The MBWA group welcomes and encourages the participation of all that have expertise in wirless mobile technologies. We believ a knowlegeable working group accelarates work rather than slowing it down.

(5)T1P1 is "the Technical Subcommittee of Committee T1 responsible for Wireless/Mobile Services and Systems. Committee T1 is also a founding partner in the Third Generation Partnership Project (3GPP)which is responsible for the global standardization of GSM-based wireless." When the project behind this PAR was originating,T1P1 wrote to 802.16 (IEEE L802.16-02/11):"It appears that the Study Group on Mobile Broadband Wireless Access Networks (MBWA)is addressing issues that are already being pursued by other global standards organizations.Our concern is this could result in duplicative and possibly counterproductive efforts.".2002-11-13 IEEE 802.16sgm-02/13 If this project proceeds,how would you reply to T1P1?

The answer to T1P1 is actually contained in the excerpt of the T1P1 minutes cited by you in Item 6 and also in my response to that item. Also please note that Mr. Chaterjee's letter itself states that 3GPP "is responsible for the global standardization of GSM-based wireless." What is being proposed is not GSM-based. It is a new air-interface optimized for packet data traffic unencumbered by any legacy constraints.

(6)According to the "T1P1/2002-080 Report of T1P1 Meeting with Representatives of IEEE July 24,2002 ":"Mr.Klerer explained that an Executive Study Group had been formed under IEEE 802 to explore new work in the area of Mobile Broadband Wireless Access at vehicular speeds. Mr.Klerer noted that this work, which was being explored, was without relationship to any currently existing IEEE 802 standards, and the approach is to design an interface that is optimized for IP-based technology. He explained that the ultimate goal of this work would be to provide service optimized so that any application that works on the wired network will work seamlessly just as well on the wireless network. In response to a question of Mr.Mark Younge, Vice Chair of T1P1,Mr.Klerer noted that this type of technology could be used by different kinds of commuters —such as the passengers in cars as well as railway commuters. Dr.Chatterjee asked why

Mr.Klerer had chosen to bring this work into IEEE, as opposed to say, T1P1. Mr.Klerer explained that he felt the best place for the work would be IEEE since it was to be based on a 'pure-IP ' environment. He also noted that bringing it to IEEE would prevent any confusion about whether the technology had closer ties to 3GPP or to 3GPP2.He noted that ultimately the work would be brought to the groups such as T1P1 for their assistance and input. **Dr. Chatterjee extended an invitation to Mr.Klerer to bring this work into T1P1. He noted that T1P1.4 WWINA is doing work on a data-centric technology intended for Internet access, and that it was working well. Mr.Klerer expressed his gratitude at the offer but noted that he could not make a decision on a split from IEEE at this time. Mr.Klerer did note that it would be crucial to work this issue with T1P1,and also noted that he will bring T1P1 's offer forward to the rest of the members of the Executive Study Group for their consideration."**

We would like to know the response of the Executive Committee Study Group to this invitation.

It is not clear what the above question has to do with the content of the PAR and seems to be inappropriate.

However, to clarify the events of the meeting, Mr. Klerer had been contacted by Mr. Chatterjee prior to the meeting and as also indicated by the context above, the question posed to Mr. Klerer was why he (i.e. his company) "had chosen to bring this work into IEEE, as opposed to say, T1P1". The answer is also given above in the excerpts from the minutes. This was an offer made to Mark Klerer & his company to abandon working in the IEEE as indicated by Mr. Klerer's answer that he would not make a decision to split from the IEEE. The discussion then proceeded on to cooperation between the groups and this is the offer that was brought to the ECSG. That offer was accepted by the ECSG, as indicated by identifying T1P1 as a future liaison organization.
It should also be noted that thw WWINA work is T1P1 work that actually addresses "systems optimized for internet data applications in low mobility (handoff) environments".

(7) Item 15 refers to the deficiencies in existing 3G systems for transporting data. Where these deficiencies do occur, they are primarily in the network architecture of current mobile systems and have little to do with the 3G air interface(s). It is not evident how the adoption of a new mobile air interface within IEEE 802 will result in a more cost-effective data solution when the issue is with the network architecture, not the air interface.

In spite of enhancements for transporting data, all 3G systems are fundamentally *voice-centric*. The deficiencies for carrying data (in terms of spectral efficiency, latency, etc.)

are not only due to the network architecture but also due to the single-threaded call model structure of the air interface(s). Some issues include the following:

- **Circuit-switched uplink.** In all 3G air interfaces (even those optimized for data such as 1xEVDO), circuits are set up and torn down between the mobile terminals and the radio network controller (RNC) between idle periods. (Packet scheduling is not used for data packets on the uplink.) This is detrimental for uplink data rates, capacity and latency.
- **Voice-centric channel parameters.** The slot time in the PHY/MAC in 1xRTT and WCDMA is large (on the order of 10ms). This prevents efficient scheduling and power-control, resulting in higher latencies and poor performance for bursty packet data.
- **Contention-based access.** For users with bursty data sessions to regain access to air-link resources, the use of contention introduces latency and delay variations.
- **Intra-cell interference**. In 3G air interfaces, the negative impact of intra-cell interference on spectral efficiency, capacity and performance makes it difficult to support high aggregate data rates.
- **Insufficient support for QoS.** The Quality of Service (QoS) support for data delivery over the air is currently "best effort" in 3G.

The MBWA project, which is fundamentally *data-centric*, will address these issues by targeting significantly higher spectral efficiency, lower latencies and improved user experience. This technical differentiation provides for wide market potential not adequately addressed by 3G systems.

8) In item 18, the table lists a number of target parameters. 3GPP (UMTS) is currently standardizing a High Speed Data Packet Access mode with similar values. The 3GPP values are based on very rigorous real world simulations and manufacturers willingness to certify performance. Again, it is not evident that the air interface proposed in this PAR will result in features or capabilities significantly enhanced beyond other mobile systems currently being standardized.

HSDPA is a data enhancement for a voice-centric 3GPP system that suffers from many of the same limitations. To address the points raised in this comment:

- **The parameters for HSDPA and MBWA are not similar.**
  - HSDPA is a downlink-only technology that addresses the asymmetric data market, while MBWA will be optimized for both uplink and downlink.
  - The peak HSDPA data rates yield are lower than that of MBWA (e.g., 8-10 Mbps for HSDPA vs. 15-20 Mbps for MBWA in 5MHz channels). Furthermore, the sustained data rates for HSDPA are likely to be far lower in practice due to its use of CDMA.

- **Simulations and certification.**
  - According to 3GPP, HSDPA has been optimized for low mobility scenarios, and simulations for HSDPA have been performed only for speeds up to 120 Km/hr.

  - We are not aware of any manufacturers who have “certified” equipment to meet the performance levels of HSDPA-specified data rates.

- **Features and capabilities of MBWA beyond HSDPA**
  - MBWA is optimized for *both* uplink and downlink data transmission.
  - MBWA supports vehicular mobility up to 250 km/hr.
  - MBWA will address Quality of Service (QoS), while data transmission in HSDPA is “best effort.”
  - A core design objective of MBWA is to allow for a large number of active users with high sustained data rates, resulting in a superior user experience and operator benefit.

For these reasons, we believe that the MBWA project will result in a superior solution for high-speed mobility, which will be sufficiently distinct from HSDPA.