Project	**IEEE 802 Executive Committee Study Group on Mobile Broadband Wireless Access** <**http://grouper.ieee.org/groups/802/mbwa**>	
Title	**Initial Views on the Desired Characteristics of Mobile Broadband Wireless Access Air Interface**	
Date Submitted	**2002-09-11**	
Source(s)	MBWA ECSG Contact: Mark Klerer	Voice: 908-997-2069 Fax: 908-997-2050 Email: m.klerer@flarion.com
Re:		
Abstract	The attached document provides an initial view on the desired characteristics of Mobile Broadband Wireless Access Air Interface	
Purpose	This document provides information, in addition to the information contained in section 12 of the PAR, concerning the scope of the MBWA project.	

Initial Views on the Desired Characteristics of Mobile Broadband Wireless Access Air Interface

1 Introduction

The MBWA Air-Interface (AI) will be optimized for high-speed IP-based data services operating on a distinct data-optimized RF channel. The AI will provide for compliant Mobile Terminal (MT) devices for mobile users, and will enable significantly improved performance relative to other systems targeted for wide-area mobile operation. The AI will be designed to provide improved performance attributes such as peak and sustained data rates and corresponding spectral efficiencies, system user capacity, air-interface and end-to-end latency, overall network complexity and Quality-of-Service management.

2 Desired Characteristics

2.1 Service Characteristics

- **Applications**: The AI should support interoperability between an IP Core Network and IP enabled mobile terminals to allow applications including, but not limited to, full screen, full graphic web browsing, e-mail, file upload and download without size limitations (e.g., FTP), video and audio streaming, IP Multicast, VPN connections, VoIP, instant messaging and on-line multi-player gaming.
- **Always on**: The AI should provide the user with “always-on” connectivity. The connectivity from the wireless MT device to the Base Station (BS) should be automatic and transparent to the user.
- **Inter-technology roaming and handoff**: The AI should support roaming and handoff with different wireless access systems, e.g. wireless LAN.
- **Open interfaces**: The AI should support open interfaces between any network entities in the AI that may be implemented by service providers and manufacturers as separate systems, sub-systems, or network entities. IETF protocols should be considered and adopted in these open interfaces wherever possible.
- **QoS support**

  The AI should support the means to enable end-to-end QoS within the scope of the AI and should support a Policy-based QoS architecture. The resolution of QoS in the AI should be consistent with the end-to-end QoS at the Core Network level.

  The AI should support IPv4 and IPv6 enabled QoS resolutions.

  The AI should support efficient radio resource management (allocation, maintenance, and release) to satisfy user QoS and policy requirements.

2.2 Air Interface Characteristics

- **Layered architecture**: The AI should support a layered architecture and separation of functionality between user, data and control planes.
- **MAC States**: The AI should support multiple MAC protocol states with fast and dynamic transitions among them. This allows the system to conserve air-link resource usage for users when they are not actively sending or receiving data by temporarily placing them in dormant states that require fewer system resources (e.g., control messages) to maintain. By making such transitions fast and dynamic, the system capacity is improved while maintaining the user experience (e.g., maintaining good end-to-end TCP/IP performance).
- **Resource allocation**: The AI should support fast resource assignment and release procedures on the uplink and downlink for maximum utilization, especially for bursty IP applications.
- **Handoff**: The AI should provide inter-sector and inter-cell handoff procedures at vehicular speeds that minimize packet loss and latency for robust and seamless (i.e., without service interruption) IP packet transmission.
- **Latency**: The AI should minimize the round-trip times (RTT) and the variation in RTT for acknowledgements, within a given QoS class, over the air interface. The RTT over the airlink for a MAC data frame should be less than or equal to 10 ms. This reduces the adverse impact on IP packet transmission. .
- **Spectrum:** The AI should be designed for deployment within existing and future licensed spectrum below 3.5 GHz. The MBWA system frequency plan should include both paired and unpaired channel plans with multiple bandwidths, e.g., 1.25 or 5 MHz, to allow co-deployment with existing cellular systems. Receiver sensitivity, blocking and selectivity specifications should be consistent with best commercial practice for mobile wide-area terminals.
- **Spectral Efficiency**: Spectral efficiency should be in excess of 1 b/s/Hz/cell in a loaded network. Additionally, the AI should support universal frequency reuse but also allow for system deployment with frequency reuse factors of less than 1 (e.g., using spatial diversity to reuse spectrum within a cell).
- **User Data Rate Management**: The AI should support automatic selection of optimized user data rates that are consistent with the RF environment constraints. The AI should provide for graceful reduction in user data rates, on the downlink and uplink, as a mechanism to maintain an appropriate frame error rate performance.
- **Authentication Functions**: The AI should provide messaging for mutual authentication of the MT and network, as well as supporting network authentication of the accessing user and measures to thwart MT cloning.
- **Data rates:** For a 1.25 MHz channel bandwidth[1], the AI should support peak aggregate data rate (user payload) per cell in excess of 4 Mbps in the downlink and in excess of 800 Kbps in the uplink. The AI should support

[1] This represents 2 x 1.25 MHz (paired) channels for FDD and a 2.5 MHz (unpaired) channel for TDD. For other channel bandwidths, the data rates may change.

peak per-user data rates in excess of 1 Mbps on the downlink and in excess of 300 kbps on the uplink. These data rate targets are established without consideration of channel conditions, traffic loading, and system architecture. The peak per user data rate targets are less than the aggregate per cell data rate to allow for design and operational choices.

- **Mobility**: The AI should support one or more of the vehicular mobility classes defined in ITU–R M.1034-1.

The numerical characteristics are summarized in the following table:

Characteristic	**Value**
Mobility	up to 250 km/hr
Spectral efficiency	> 1 b/s/Hz/cell
Peak user data rate (DL)	> 1 Mbps*
Peak user data rate (UL)	> 300 Kbps*
Peak aggregate data rate per cell (DL)	> 4 Mbps*
Peak aggregate data rate per cell (UL)	> 800 Kbps*
Airlink MAC frame RTT	<10 ms
Bandwidth	e.g., 1.25 MHz, 5 MHz
Spectrum	< 3.5 GHz

* Targets for 1.25 MHz channel bandwidth. See footnote 1.