Project	**IEEE 802.20 Working Group on Mobile Broadband Wireless Access <http://grouper.ieee.org/groups/802/mbwa>**	
Title	**802.20 Technology Evaluation Process**	
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Re:	MBWA ECSG Call for Contributions	
Abstract	This contribution provides input to 802.20 on current thinking about the air interface evaluation process, as used in 3GPP2 for development of the 1xEV-DV standard. Several areas are discussed, including system level simulation, channel modeling, and developing industry consensus and confidence in the technical solutions proposed through adopting a process of detailed technical evaluation for air interface features.	
Purpose	This document is provided as input to 802.20 on technology evaluation methods and recommends that 802.20 implement a similar approach so as to develop a solid air interface standard that meets the needs of users and service operators.	
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INTRODUCTION

As 802.20 embarks upon the important task of developing a wireless air interface, 802.20 needs to examine methodologies that are being used in the wireless industry evaluate proposed technologies. Our goals as 802.20 are to develop a wireless air interface that provides a level of performance far beyond that provided by existing standards that IEEE 802 has developed.

Over the past few years, system level simulations have emerged as the method of preference to evaluate systems in standards bodies [1]. A number of years ago, link level methods were the prime method. These looked at evaluating the required E_b/N_t required on an access terminal to access point basis. While these link level methods are important, it was found that these methods do not adequately capture the richness and dynamics of systems with multiple access points and access terminals. This is particularly true for systems that strive for high capacity, have dynamic control of access terminals, have shared usage of resources, and support data traffic in the multitude of varieties that on the Internet.

What has evolved is a combination of link level and system level methodologies. The system level simulation is the main simulation. In the system level simulation, a layout of access points and their antennas are modeled. Access terminals are randomly dropped throughout the defined coverage region. The propagation paths, shadowing, and other blockage between each of the access terminals and the access points is modeled. The fading is updated at some time interval that captures the fading and the shortest control process in the system. For example, the update interval for simulations of WCDMA and cdma2000 are at the power control period (0.67 ms for WCDMA and 1.25 ms for cdma2000). Every update interval, the received signal and noise at each access point and access terminal is determined and the received E_b/N_t is computed. From the received E_b/N_t, some error measures are determined using link level curves. These link level curves are typically generated beforehand so that the execution time of the system level simulation is low.

1 SOME ASPECTS TO TAKE INTO CONSIDERATION

1.1 Fading models

A number of different propagation models and velocities need to be taken into consideration in both the link level and system level simulations. Previous experience has shown that some aspects of a system design gives better performance in some propagation environments and other aspects gives better performance in other environments. A several different channel models are typically considered so that the performance of the system is understood over the set of expected propagation conditions. Furthermore, it important to avoid system designs that give poor performance in certain environments (e.g., one path Rayleigh fading).

1.2 Traffic Models

In the past, when systems were primarily evaluated at the link level, the traffic model was not considered. This was equivalent to what is called in system level modeling, “full

buffer" analysis, which assumes that there is an infinite source of data between each access terminal and access point. While an important component of analysis, the "full buffer" model neglects many important aspects of a system design. Neglecting these aspects has lead to designs that do not perform well when subjected to the variety of traffic found in commercial systems. Thus, it is important to model any candidate system using real traffic models. Some that should be used include FTP, web browsing, OMA (WAP), video, and voice. Note that even for these services, the access terminal to access point traffic is different than the access point to access terminal (e.g., for web browsing, most of the access terminal to access point traffic is http requests and the access point to access terminal traffic is web page downloads). It is also important to include the effects of TCP: improper system design can lead to poor performance, not as a result of problems in the link but due to unintended interactions with TCP.

2 RECOMMENDATIONS

802.20 should put together an analysis framework for evaluating the systems designs that it develops. This analysis framework should include system level simulations with realistic propagation models and traffic models.

3 REFERENCES

[1] 3GPP2 C.R.1002, *1xEV-DV Evaluation Methodology (v10).*