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LIAISON LETTER to ITU-R

Date: June 16, 2004

Dear Fabio,

1. In response to your Liaison Letter from 23 Feb. 2004, please find below:
   a. Our published standards, addressing Fixed BWA below 11GHz:

- ETSI TS 102 177 v1.1.1; Broadband Radio Access Networks (BRAN); HiperMAN; Physical (PHY) Layer
- ETSI TS 102 178 v1.1.1; Broadband Radio Access Networks (BRAN); HiperMAN; Data Link Control (DLC) Layer
- ETSI TS 102 210 v1.1.1; Broadband Radio Access Networks (BRAN); HiperMAN; System Profiles.

b. Our published standards, addressing Fixed BWA above 10GHz:

- ETSI TS 101 999 v1.1.1; Broadband Radio Access Networks (BRAN); HiperAccess; Physical (PHY) Layer
- ETSI TS 102 000 v1.3.1; Broadband Radio Access Networks (BRAN); HiperAccess, Data Link Control (DLC) Layer
- ETSI TS 102 115 v1.1.1 Parts 1 and 2, Broadband Radio Access Networks (BRAN); HiperAccess; Cell-based Convergence Layer.
- ETSI TS 102 117 v1.1.1 Parts 1 and 2, Broadband Radio Access Networks (BRAN); HiperAccess; Packet-based Convergence Layer.

c. WEB reference

The standards are downloadable at:

http://pda.etsi.org/pda/queryform.asp

while specifying in the Search box the standard number.

d. HiperMAN Network Management (MIB) standard will be finalized end 2004.
e. The HiperMAN standards are in a revision process, with the target to finalize them this year.

2. We annex the "Technical and Operational Requirements for Standards targeting Fixed BWA in frequencies below 11GHz", produced by HiperMAN, in response to your Liaison Letter. We intend to collaborate with IEEE 802.16 for producing a consolidated document, representing the view of both standardization groups. We send you our document as it is now, due to the fact that will be no other BRAN sessions before ITU-R WG9 September meeting.

3. Please inform us how ITU-R can contribute towards a worldwide approach of addressing co-existence in License Exempt bands.

Looking forward for a successful collaboration,

Bernd Friedrichs

ETSI / BRAN(04)37d045

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Annex 1 of the Liaison Letter to ITU-R

Technical and Operational Requirements for Standards targeting Fixed BWA in frequencies below 11GHz

Introduction

This document provides requirements for FBWA standards. It is mainly based on ETSI HiperMAN [1] and IEEE 802.16.3 Functional Requirements [2], for Fixed BWA systems below 11GHz.

Application and Services

Broadband fixed wireless access (BFWA) networks should support a wide range of applications in use today and be extendable to support future services. The main user applications that can be foreseen today are as follows: Internet access; LAN bridging and Remote LAN access; video-telephony and video conferencing; computer gaming; real time video and audio ;telephony, voice-band modems and fax.

P-MP deployment topology

The system shall support PMP topology. Other topologies, as Mesh, may be supported as well. In PMP systems, all data traffic shall go through the base station that shall serve as a radio resource supervisor.

Figure 1 shows an example deployment configuration. The base station can serve individual buildings, multiple subscribers in multiple buildings (using multiple radio links), or multiple subscribers in a single building by use of a single radio link and further in-building distribution systems. It shows the use of an optional repeater and route diversity in order to provide extended coverage and coverage in difficult areas. This does not imply the use of these features in all systems.

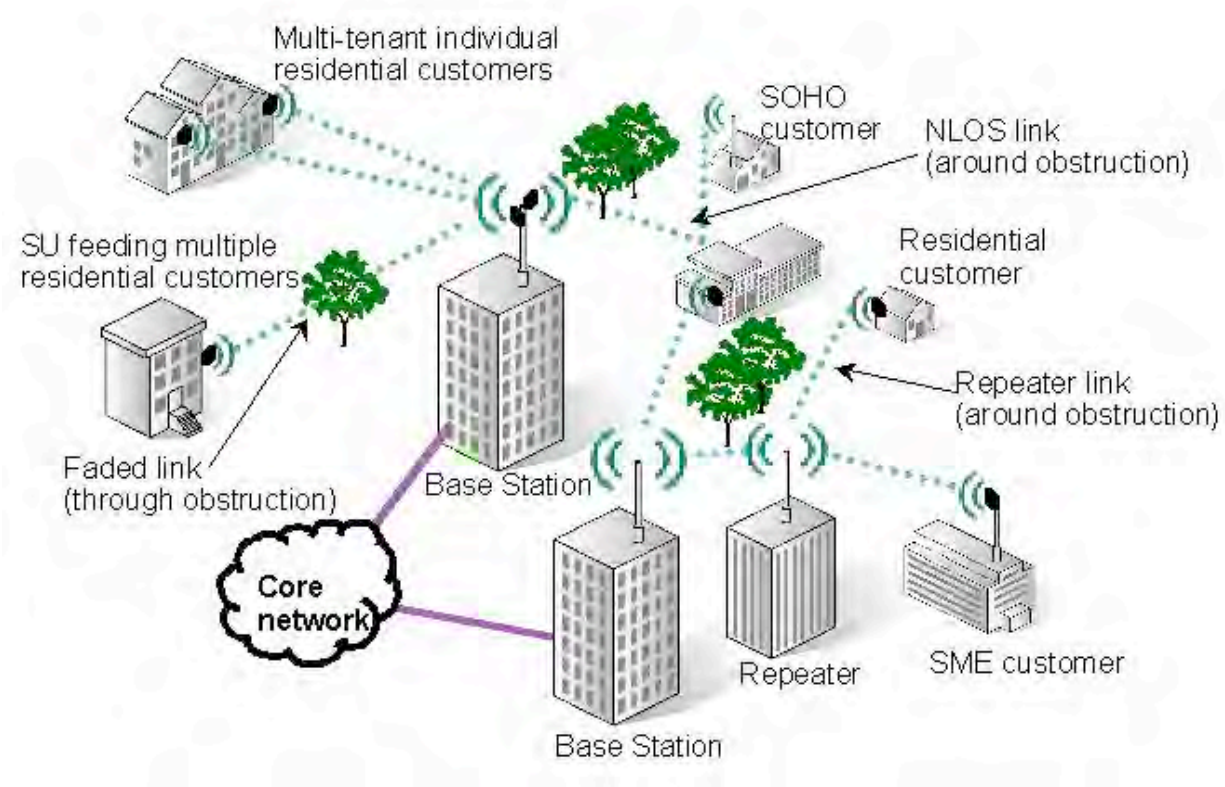

Figure 1 Example network deployment configuration based on PMP configuration

Operating frequency range and duplexing

A BFWA standard shall cover a large frequency range, while providing support for both FDD and TDD operation. The typical FDD arrangements are encountered in Licensed bands, as 3.5GHz, while TDD bands are mainly in LE applications, as 2.4GHz and 5GHz.

The standard shall support a high variety of channel spacings and Base Station sectorization, for efficient use of licensed frequency blocks.

The standard shall support systems based on FDD, or TDD, or FDD and TDD efficiently In FDD mode, the base station shall support full-duplex FDD, while the SU should be able to operate in half-duplex FDD to reduce equipment cost. In TDD mode the system should support dynamic variable duration for the up-link and the downlink, according to the existing traffic.

Deployment Requirements

Line of Sight operation

The FBWA standards shall be able to operate in Line of Sight (LOS) conditions. The large cell radius will be dependent by the operating frequency and regulatory power limits. Under some regulatory regimes, may be up to 50km in LOS, and will produce a large propagation delay difference between near and far CPE units. This difference can be as large as 150us. The FBWA standard shall provide for far CPEs' propagation delay compensation.

Non-Line of Sight operation

NLOS operation capability, which eases antenna installation, in combination with turnkey SU solutions, enables user installable terminals, which significantly cuts the deployment cost.

The FBWA standard shall be able to operate in Non-Line of Sight (NLOS) conditions. Due to the multipath inherent in the targeted frequency bands, the standard should be capable of handling several μs of delay spread with limited performance degradation.

The NLOS operation requires resistence to multi-path and increased system gain. The standards shall provide means for increasing the up-link system budget, without affecting the ST (Subscriber Terminal) cost.

Spectral efficiency

A FBWA standard shall define data rates providing a system peak spectral efficiency better than 3bit/s/Hz.

The equipment realized according to the standard shall be able to efficiently use the spectrum, with almost no degradation in capacity when co-locating Access Points and using adjacent channels.

When a multi-sector Base Station is used, shall be possible to fully use the allocated spectrum block, with no spare channels and degradation in receiver performance.

Channel Conditions

To accommodate changes in the channel characteristics, the standard shall specify functions and procedures to adjust parameters such as transmit power, modulation and error correction.

Services

Internet Protocol Services

The system must be optimized to transport variable length IP datagrams. Both IP versions 4 and 6 must be supported. For efficient transport of IPv6, TCP/IP header compression over the air interface should be supported. It should be possible to support the emerging IP-QoS efforts (e.g. MPLS, Diffserv, RSVP).

Bridged LAN services and Remote LAN access

The protocols should support bridged LAN service and Remote LAN access capabilities.

Voice services

The system shall support voice communications. The voice access transport shall be packet based. The system must support the QoS requirements of these services.

Other Services

The system shall facilitate unicast, multicast, as well as broadcast services.

Transport requirements

Service independence

A standard for Fixed-BWA system shall provide services without requiring information on the type of application.

Service Support

Quality of Service

The system shall support QoS guarantees to provide the services that shall be transported. Thus, the protocol standards shall define interfaces and procedures that accommodate the requirements of the services with respect to allocation of prioritization of radio resources.

The system shall support different classes for service quality in terms of delay, jitter, packet error ratio and data rates. Jitter generated in the system should be taken into account in the design of the buffers. Jitter automatically impacts the total delay of the system and is therefore included in the Max. Delay in Table 1.

Error! Reference source not found. shows a variety of typical currently available applications and their required bandwidths and dependencies on QoS.

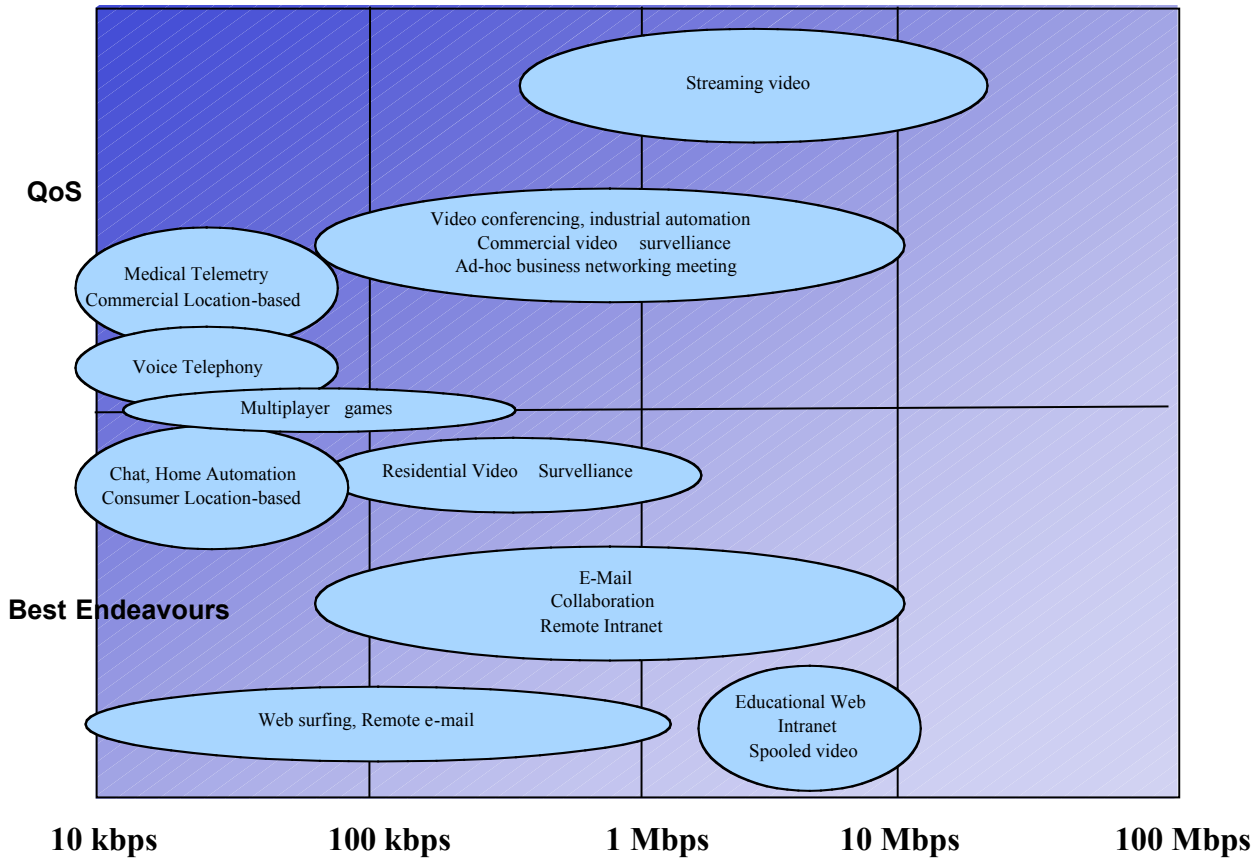

Figure 2: Some currently available applications and their typical bandwidth and QoS requirements

Table 1: Service QoS Requirements

Service	Max. Delay (ms) including jitter, for at least 95 % of the packets (note)	Max. Jitter (ms) for at least 95 % of the packets (note)	Packet Error Ratio (note)	Data rates
Voice	20	10	3 %	≤ 64 kbit/s
Time Critical Data	40	20	0,2 %	≤ 400 kbit/s
Streaming	100	50	1 %	≤ 1 Mbps (Info: Audio: realaudio/mp3 < 96 kbit/s, MPEG4 speech < 24 kbit/s Video: MPEG4 < 4 Mbps for broadcast quality full screen video, Video conferencing quality video with H.26: 100 kbit/s)
Non-Time Critical Data	N/A	N/A	0,1 %	N/A
The QoS parameters are specified between two convergence layers on a single radio link.				

Service Classes

Three classes of service are recognized as per IETF recommendations, which shall be supported:

- Expedited Forwarding (EF): This class of service can have a varying bandwidth requirement over time, but tolerance of delay and jitter are limited (example: VoIP).
- Assured Forwarding (AF): Within this class of service, the bandwidth can vary over time within limits, but the tolerance of delay and jitter are higher than EF.
- Best Effort: The bandwidth in this class varies widely and is allowed to burst up to the link capacity not occupied by EF and AF traffic. Delay and jitter tolerance is high.

The standard shall support different Classes of Service, according to traffic classification.

Service QoS Mappings

The basic mechanism available within the systems for supporting QoS/service class requirements shall be able to allocate various bandwidths to various services. The protocols shall include a mechanism that can support dynamically variable bandwidth channels and paths (such as those defined for IP environments).

Since customer units will contend for capacity to/from one or more base stations, the standard shall efficiently resolve contention and bandwidth allocation.

Flexible Asymmetry

Over a short period of time (e.g. a few seconds) the traffic generated by and for any given user can be highly asymmetric in either way. The system shall efficiently support this type of asymmetric traffic. Over longer periods of time, a given user can need on average more bandwidth in one way than in the reverse way. The system shall therefore enable the operator to grant asymmetric traffic contracts.

The total traffic generated by and for all the users sharing the same radio resource may be instantaneously asymmetric or even asymmetric during a long period of time, depending on the type of users connected to the shared resource. This global asymmetry can be handled differently with TDD and FDD modes. In TDD mode, a global dynamic asymmetry in the range of 10 % upstream, 90 % downstream to 90 % upstream, 10 % downstream should be supported. In FDD mode, the modulation type and coding should be adjustable to maximize total sector capacity and near the capacity asymmetry to the traffic asymmetry.

Per-Subscriber Rate Adaptation

A FBWA standard shall define different modulation and/or coding options for far and near subscriber stations. In this way the data rate to/from relatively near subscribers can be higher, increasing the overall system capacity. Additionally, far subscribers can experience different interference profiles and so would benefit from rate adaptation. The BWA standard shall provide for multirate support.

The standard must accommodate channel capacity issues and changes in channel capacity to meet contracted service levels with customers. For example, flexible modulation types, power level adjustment, and bandwidth reservation schemes should be employed.

Throughput requirements

Target Throughput

To be competitive with wired solutions, it is desirable for the system to support a data rate at the Access Point of 25 Mbit/s, which is the instantaneous aggregated bit rate (up- plus downstream), and shall be shared among the users or shall be capable of being allocated to one user. The system shall accommodate different types of STs with different maximum data rates. This for example allows optimization of the cost-performance ratio for specific markets/customers and operation with longer ranges.

Peak Data Rate

The FBWA standards shall support the peak data rate in either or both directions to a subscriber station within the specified distance from the base station. The standard shall allow for peak data rate higher than 10Mb/s/user.

Scalability

The protocols should allow for different capacities and performance for the system instances. The system should support features to maximize the scalability of a deployment.

Radio specific security requirements

The system shall provide secure means of authentication, authorization and adequate means of encryption to ensure privacy.

Authentication

There are two levels of authentication for the system. The first level of authentication is when the subscriber unit authenticates itself to the access network. This initial authentication shall be strong in order to prevent "enemy" subscriber unit from entering the network or an "enemy" base station from emulating a real base station. Once the initial authentication at this level is complete, subsequent authentication at this level can be a little more relaxed. The standard shall support this level of authentication.

The second level of authentication, between the user and the NMS (Network Management System), should be handled by higher layer protocols.

Authorization

Authorization is a security process that determines which services an authenticated user is permitted to invoke. Each user has a set of credentials that describe what the user is "allowed" to do. The standard shall identify a standard set of credentials and allow for vendors to extend the defined credentials with non-standard credentials. Some possible credentials are:

- Permission to access the system;
- Permission to request up to a defined QoS profile (bandwidth, delay, etc.);

- Permission to operate certain services (IP, Remote Bridging, Digital Audio/Video, etc.).

User authorization requests and responses shall be transacted securely.

Privacy

Privacy is a security concept that protects transmitted data from being intercepted and understood by third parties (e.g. an "enemy" subscriber unit, base station or passively "listening" radio).

The system should allow a cryptographic algorithm to be employed that is internationally applicable. Facilities shall also be defined in the protocol for the use of alternate cryptographic algorithms that can be supported.

Management

The standard shall define a network management interface based on existing open standard protocols (for example SNMP), which enables the following management aspects:

- Fault and Performance management

  The protocols must enable fault and performance monitoring, as well as provide means for local and remote testing. The management functionality must include reboot, reactivation and shutdown capabilities.

- Configuration and software upgrading management

  The protocols must enable both local and remote configuration including the updating of software in any device in the network without service interruption.

- Security

  The system shall enable centralized authentication and authorization services.

- Service management

  The protocols must permit operators to enforce service level agreements (SLAs) with subscribers by restricting access to the air link, discarding data, dynamically controlling bandwidth available to a user or other appropriate means. The protocols must permit the subscriber to monitor the performance at the ST.

- Interoperability

  The network management system shall enable provisioning and operation of a number of different STs provided by several suppliers on a BS.

- Accounting and Auditing

  The system management framework, architecture, protocols, and managed objects must allow for operators to effectively administer accounting and auditing, by making available the relevant information to an external billing system. An operator must be able to account for time- and bandwidth utilization (i.e. throughput) and the various QoS parameters for each subscriber.

Any radio relay or repeater function shall be a managed element.

References

[1] ETSI TR 101 856 V1.1.1 (2001-03), Broadband Radio Access Networks (BRAN); Functional Requirements for Fixed Wireless Access systems below 11GHz: HIPERMAN.

[2] IEEE 802.16.3-00/02r4, 22.09.2000, “Functional Requirements for the 802.16.3 Interoperability Standard”