

Project	IEEE 802 Executive Committee Study Group on Mobile Broadband Wireless Access < http://ieee802.org/20 >	
Title	FER: Do We Need It?	
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Re:	802.20 WG Call for Contributions	
Abstract	This document provides a summary of comments pertaining to the wording for frame error rate requirement statement in 4.1.10/11 of the 802.20 Requirements Document	
Purpose	Contribute to the discussion and development of the 802.20 Requirements and Channel Model.	
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Spetember 15, 2003

Outline

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- 📄 **Comments Summary**
- 📄 **Dilemma Posed by Comments**
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Purpose of FER Requirement

- Quantify the statement from the PAR:
“Provide an efficient packet based air interface optimized for IP”
- Baseline the minimum performance for the PHY and MAC layers of the air interface
- Define a measurable system level performance requirement for air interface reliability

4.1.10: Frame Error Rate Requirement Initial Exploder Broadcast

The physical layer shall be capable of adapting the modulation, coding, and power levels to accommodate RF signal deterioration between the BS and user terminals. The air interface may use appropriate ARQ schemes to ensure that error rates are reduced to a suitably low level in order to accommodate higher level IP based protocols (for example, TCP over IP). The frame error rate shall be less than 1 percent, with 95% confidence, after channel decoding and before any link-level ARQ, measured under conditions specified in Section xx.

Summary of Comments

Reference protocol & structure

- Ensure MAC SDUs error ratio not more than X while having PHY SDUs error ratio = Y
- Define a new layer structure for MBWA systems in IEEE802.20 which includes all features of MBWA characteristics.
- Frame application QoS requirements in a more unified and comprehensive manner through use of the diffserv architecture
- Remove all ARQ to the MAC layer
- Requirement as written puts QoS in the PHY
- Should specify post-air-interface-ARQ in scenarios where air interface ARQ is in effect
- Most data comm systems do ARQ in combinations with the QOS

Summary of Comments (cont)

MAC Protocol

- RLP is very effective in cleaning up the wireless channel so that TCP can be efficiently used.
- There is little difference between RLP frame and physical frame conceptually in cdma2000 systems.
- A functionality of RLP is necessary but we don't have to use the same RLP as cdma2000 for MBWA.

Frame Size Issue

- Need to have length of frame or number of bits in frame.
- A generic requirement could bias towards short frames
- FER requirement as written favors small frame size
- If FER is taken in the context of maximizing throughput, the MAC layer **SHOULD** choose the largest possible frame size.

Summary of Comments (cont)



Service Level

- Different applications having different target FER vs latency tradeoffs
- Air Interface (PHY+MAC) should include mechanisms to allow control of a range of latency vs. data loss/error rates subject to application types
- FER seems to be irrelevant absent the specifics of the design and would have different performance implications for different designs.
- Packet error rate and an operator's actions are deployment issues that more properly belong in the evaluation document
- Remove requirement since MBWA will provide diverse services with different error and ARQ requirements

Summary of Comments (cont.)

General & misc.

- Requirements for adaptive modulation and coding, and for power control covered elsewhere
- Focus on high level functional requirements and not specify specifics such as frame length.
- Keep the requirement “simple”
- If spectral efficiency is the primary requirement here, then perhaps we do not need a separate frame error rate requirement.

The FER Requirement Dilemma

☞ **Make it simple**

☞ **Make it measurable**

☞ **Make it inexpensive to test**

☞ **Make it application independent**

- Addressing all possible applications unrealistic
- Terminal providers will need a common base line for optimal IP network performance

OR

☞ **Do not have a baseline FER requirement**

☞ **Specify by application type**

- Increased testing cost

☞ **LETS LOOK AT THE BASICS**

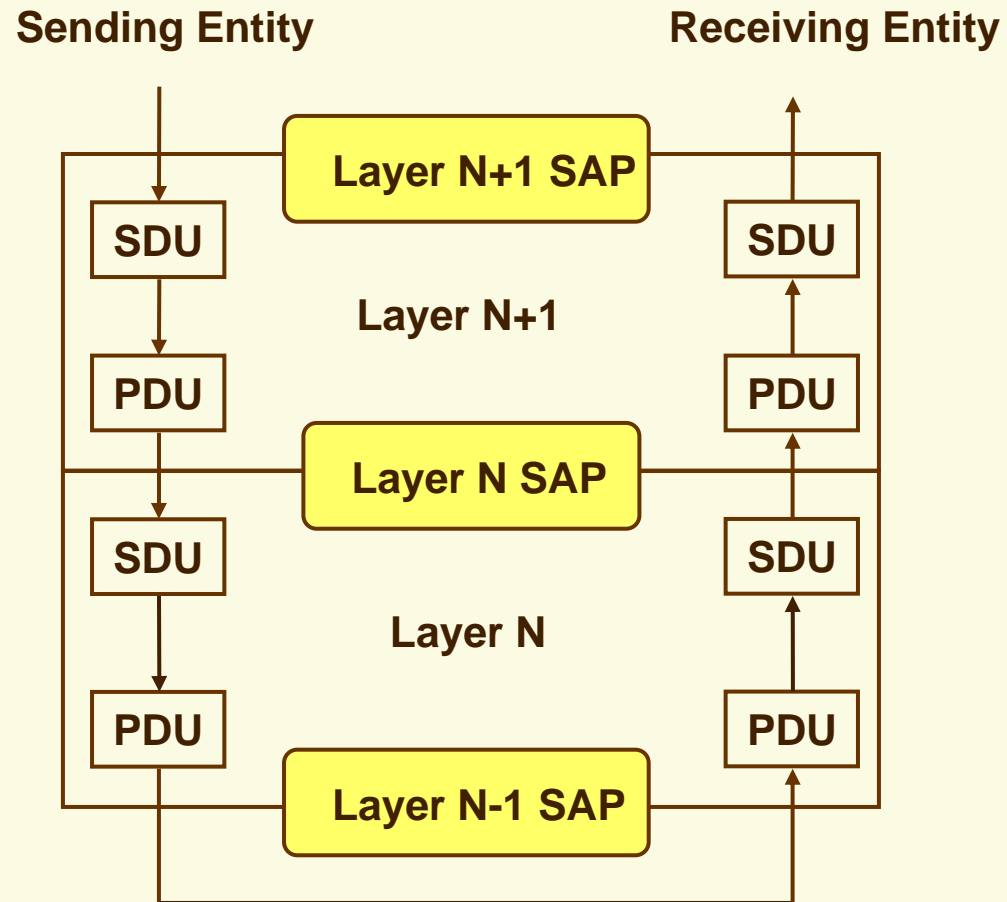
IEEE Std 802[®]-2001: 7.3 Error Rates

 Error performance of IEEE 802 LANs and MANs is required to be such as follows:

- b) For wireless physical media: Within a single access domain, the probability that a MAC Service Data Unit (MSDU) is not delivered correctly at an MSAP of an intended receiving MAC service user, due to the operation of the Physical layer and the MAC protocol, shall be less than 8×10^{-8} per octet of MSDU length.

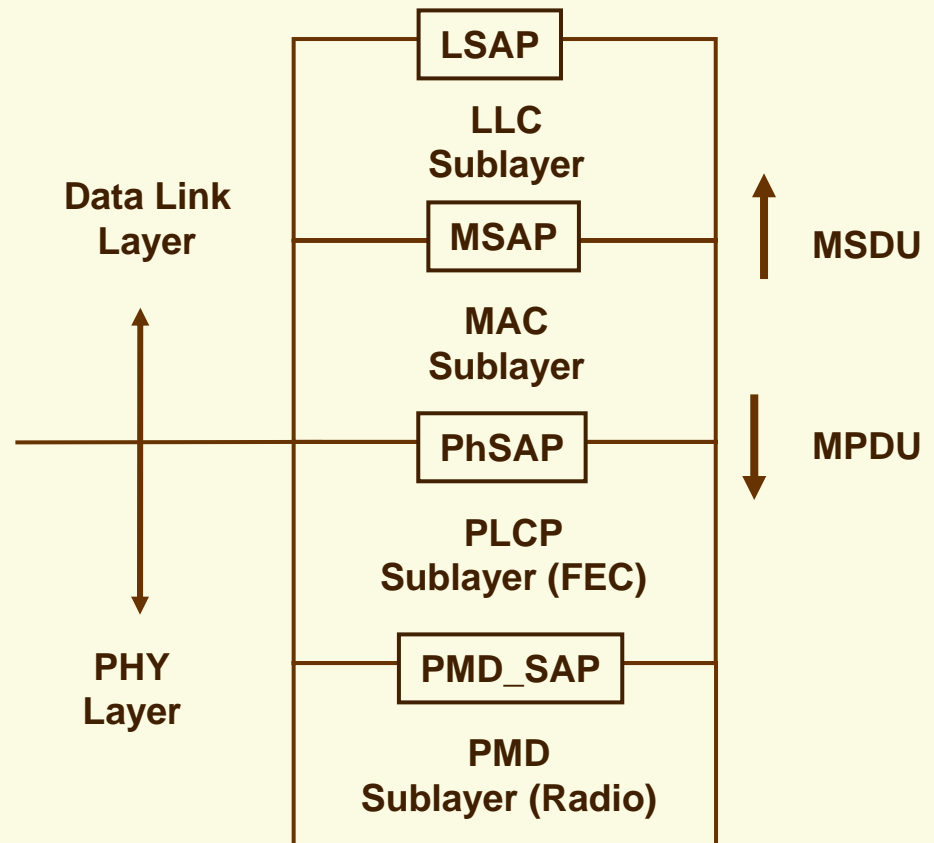
- c) The probability that an MSDU delivered at an MSAP contains an undetected error, due to operation of the MAC service provider, shall be less than 5×10^{-14} per octet of MSDU length.

PDU and SDU In Protocol Stack

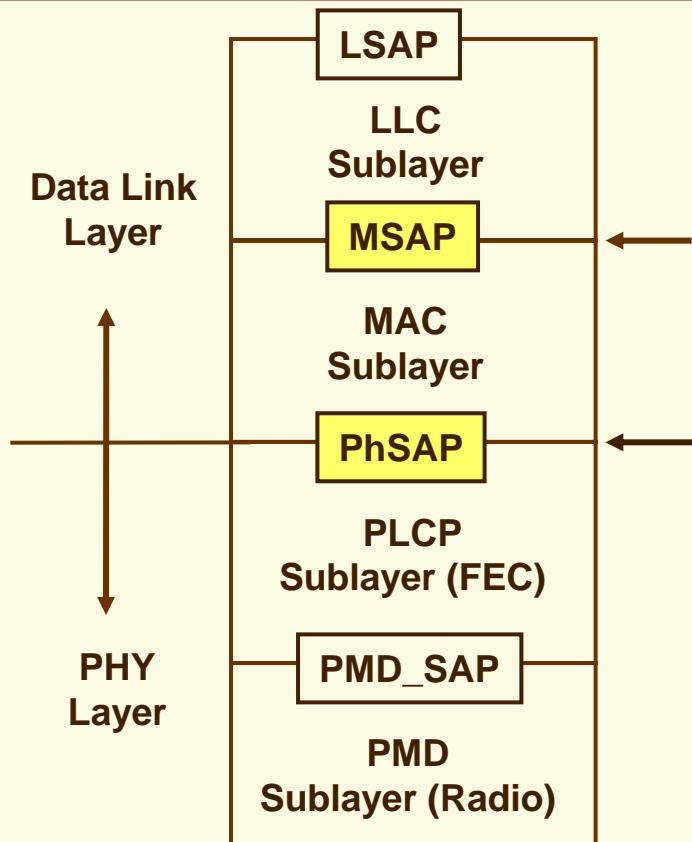


Reference Model Partitioning

- LSAP: LLC Service Access Point
- MSAP: MAC Service Access Point
- PhSAP: PHY Service Access Point
- PLCP: PHY Layer Convergence Protocol
- PMD: Physical Medium Dependent



Proposed FER Requirement Model



Specify FER or BER for SDU delivered to MSAP

Specify FER or BER for SDU delivered to PhSAP

Require flexibility to disable ARQ or to operate at higher FER or BER for SDU frames

Give requirements for specific applications in Evaluation Document

Recommended FER Requirement

- ☞ The PHY and MAC layers **SHALL** be capable of adapting the modulation, coding, FEC and ARQ and power levels to ensure that SDU frame error rates are reduced to a level to meet performance requirements of higher protocol layers (e.g., TCP over IP).
- ☞ For a frame error rate of **TBD** for a 1024 byte SDU frame size delivered to the PhSAP, the probability that a MSDU is not delivered correctly at an MSAP due to the operation of the Physical layer and the MAC protocol, **SHALL** be less than **TBD** per octet of MSDU length.
- ☞ The PHY and MAC layers **MAY** operate at higher frame and octet error rates for different applications, such as for decrease latency in real time applications (e.g., VoIP or streaming video).

Closing Comments

- ☞ **Need reference model defined**
- ☞ **Need reference model layer and sublayer functions defined**
- ☞ **Need a requirement that defines the expected performance baseline for the IEEE802.20 air interface optimized for IP**
- ☞ **Need adherence to existing IEEE802 specifications**