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Resend in HiperLAN 2

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Abstract

The basic idea is to use the transmission relay, which allows you to keep the plants out of reach for the access point H / 2. Use submitted by the principle of using the structure of the new sub-MAC framework, called the new element of H / 2 mobile terminal forward (FMT), which serves stations elusive. We analyze the impact on the quality of service FMT (Quality of Service) system H / 2. After analyzing the possible expansion of the service area.

Keywords: Quality of Service, FMT, HiperLAN/2, Protocol Architecture

1. Introduction

With the beginning of the new century have increased the need for communication with mobile broadband speeds in recent years with the imposition of new demands for wireless local area networks (WLAN). Here in this paper is to provide an overview of the two standards together with the results of physical performance simulation for each layer of Transport defined in the criteria., the differences between the standards (PDU size, and the upper layers protocol etc.) and discusses the implications for productivity applications

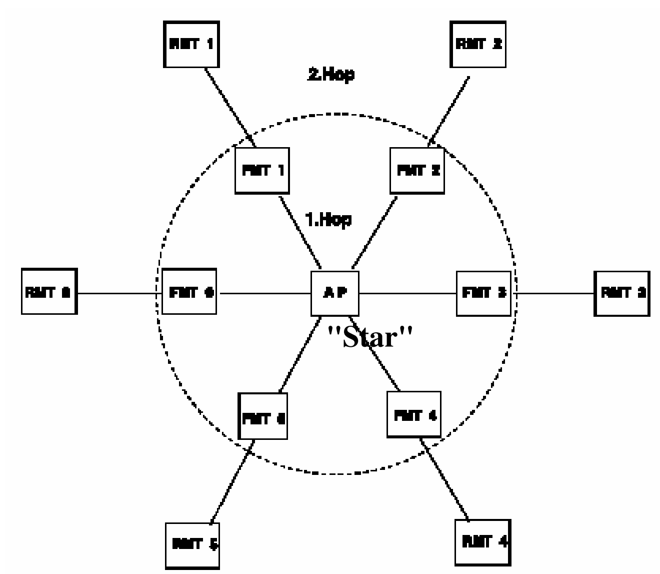
2. Theoretical Consideration

HiperLAN/2 functional specification was accomplished February 2000. Hiperlan 2 is designed as a fast wireless connection for many kinds of networks. Those are UMTS back bone network, ATM and IP networks. Also it works as a network at home like HiperLAN/1. HiperLAN/2 uses the 5 GHz band and up to 54 M bit/s data rate.[1] The physical layer of HiperLAN/2 is very similar to IEEE 802.11a wireless local area networks. However, the media access control (the multiple access protocol) is Dynamic TDMA in HiperLAN/2, while CSMA/CA is used in 802.11a.

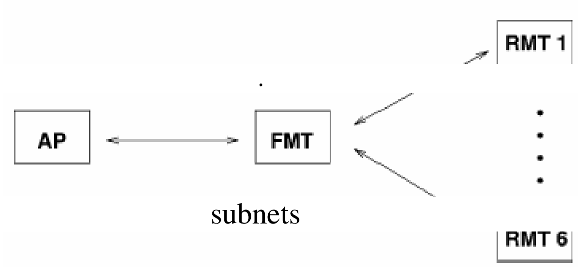
The standard covers Physical, Data Link Control and Convergence layers. Convergence layer takes care of service dependent functionality between DLC and Network layer (OSI 3). Convergence sub layers can be used also on the physical layer to connect IP, ATM or UMTS networks. This feature makes HiperLAN/2 suitable for the wireless connection of various networks.

2.1_THE principle of FMT

To test the principle of FMT and FMT to investigate the influence of parameters such QoS, as delay and throughput of the system, studies were conducted in simulation models.



Some for MT were placed outside the reach of the AP, as a RMT, associated with FMT. FMT linked directly to the AP. As FMT and RMT, presumably, has one MAC connection. FMT six and six are grouped around the RMT AP in the example scenario.
This scenario is further Script "Star" and is used as a test scenario to investigate the effects when the number of FMT.



In addition, the scenario in is used to study the effect of RMT, served by FMT. This set of RMT is a script for the service subnets FMT

Modeling system can be loaded with different constant speeds, Poisson, or video data stream generators. In the simulations have been used through-user connections (ie connections between the AP and RMT) loaded flow exchange with the Poisson distribution. Each user connection has been uploaded to the same data stream, while the additional user connections by FMT to the AP were not considered

The most pernicious effect represented by the principle - this decrease in throughput, since the data has to travel twice in a two-stage connection. To as much as possible to reduce the impact re -send bandwidth, the second stage used the higher modulation schemes (higher modulation shames). The number of RCH in the second stage was reduced to one, to thereby obtain additional bandwidth. The simulation results are shown in Table.

Table. General parameters of simulation model :

parameter	1st stage	Stage 2
The number of RCH	4	1
Fiz. LCH mode	16QUAM 3/4	64QUAM 3/4
Fiz. mode FCH	BPSK 1/2	BPSK 3/4
Fiz. SCH mode	BPSK 1/2	BPSK ¾

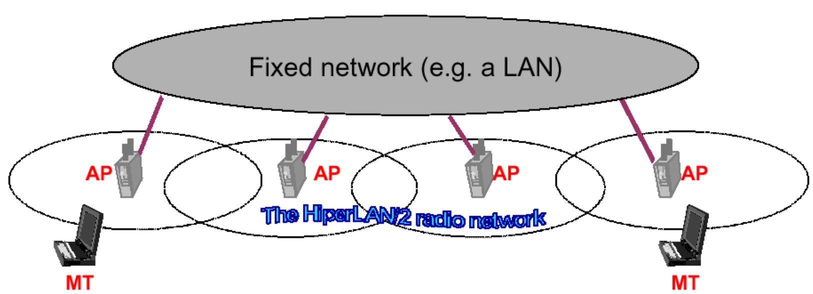


Figure 1: A HIPERLAN/2 network.

HiperLAN/2 network typically has a topology as depicted in figure 1 below. The Mobile Terminals (MT)communicate with the Access Points (AP) over an air interface as defined by the HiperLAN/2 standard .

There is also a direct mode of communication between two MTs, which is still in its early phase of development and is not further described in this version of the document. The user of the MT may move around freely in the HiperLAN/2 network, which will ensure that the user and the MT get the best possible transmission performance . An MT, after association has been performed (can be viewed as a login), only communicates with one AP in each point in time. The APs see to that the radio network is automatically configured, taking into account changes in radio network topology, i.e. there is need for manual frequency planning

2.2 Protocol Architecture of The Layers

physical layers

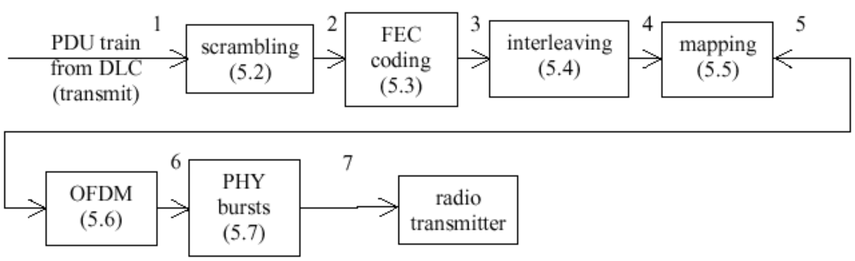


Figure PHY modes for HIPERLAN/2.

The data field is composed of a train of SCH and LCH PDUs that are to be transmitted or received by a mobile terminal.
Orthogonal frequency-division multiplexing (OFDM) has been selected as the modulation scheme for HIPERLAN/2, due to good performance on highly dispersive channels.15 In terms of sensitivity and performance when subjected to co-channel interference at a bit rate of 25 Mbit/s, coherent OFDM outperforms single-carrier modulation by 2 to 3 dB. Single-carrier modulation cannot efficiently support high bit rates this is an important factor, since HIPERLAN/2 is required to support much higher bit rates. A drawback of OFDM is power amplifier back-off, which affects coverage. For the spectrum mask that has been specified for HIPERLAN/2, the OFDM related power amplifier back-off is 2 to 3 dB greater than that of single-carrier modulation. In terms of coverage, however, this Weakness of OFDM is

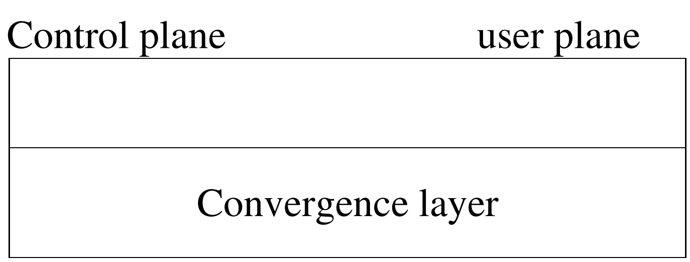
compensated for by greater sensitivity. Power consumption in mobile terminals, which is also affected by power amplifier back-off, should be considered together with

1 - reduced power consumption in the OFDM receiver.
2 - the ratio of downlink and uplink traffic which is expected to be highly asymmetrical

Physical layer modes on HiperLAN 2

Mode	Modulation	Code rate	PHY bit rate	bytes/OFDM
1	BPSK	½	6 Mbps	3.0
2	BPSK	¾	9 Mbps	4.5
3	QPSK	½	12 Mbps	6.0
4	QPSK	¾	18 Mbps	9.0
5	16QAM	9/16	27 Mbps	13.5
6	16QAM	¾	36 Mbps	18.0
7	64QAM	¾	54 Mbps	27.0

Data Link Control Layer



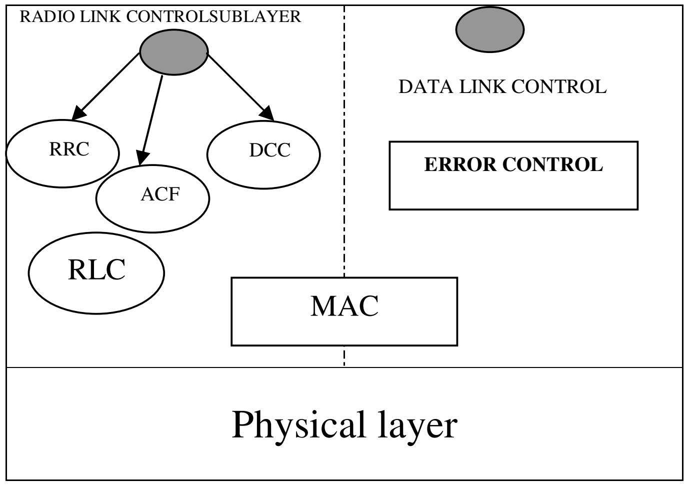


Figure HIPERLAN/2.funcation

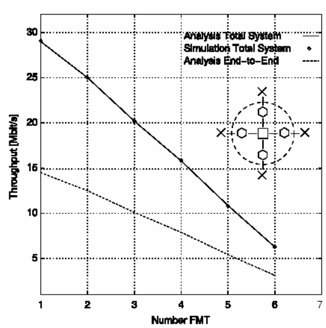
RRC	Radio Resource Control	Responsible for radio resource handling, channel monitoring, channel selection etc.
ACF	Association Control Function	Responsible for association procedure as well as resuscitation procedure
DCC	DLC Connection Control	Responsible for DLC connection control, for example connection setup procedure and connection monitoring
RLC	Radio link Control	
MAC	Medium Access Control	Responsible for sharing of the capacity of the radio link among different MTs and connections.

The Data Link Control (DLC) layer constitutes the logical link between an AP and the MTs. The DLC includes functions for both medium access and transmission (user plane) as well as terminal/user and connection handling (control plane). Thus, the DLC layer consists of a set of sublayers :
1 - Medium Access Control (MAC) protocol.
2 - Error Control (EC) protocol.

3 - Radio Link Control (RLC) protocol with the associated signalling entities DLC Connection Control (DCC), the Radio Resource Control (RRC) and the Association Control Function (ACF) .
In summary, the RLC is used for exchanging data in the control plane between an access point and a mobile terminal for instance, the mobile terminal forms associations with the access point via RLC signaling.
After completing the association procedure, the mobile terminal can request a dedicated control channel for setting up radio bearers. Within the HIPERLAN/2 specification, radio bearers are referred to as DLC connections. The mobile terminal might even request multiple DLC connections, each offering unique support for quality of service (QoS) as determined by the access point. Set-up of the connection does not necessarily result in immediate assignment of capacity by the access point. Instead, the mobile terminal receives a unique DLC address that corresponds to the DLC connection .

2.3 The maximum capacity

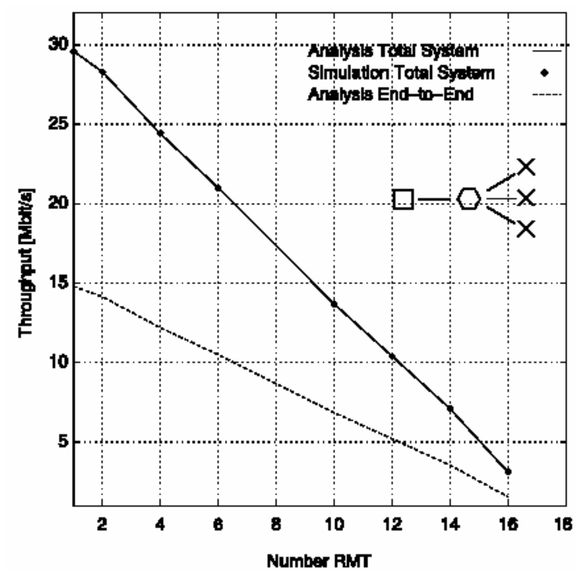
Study the maximum throughput of the system were made for the script and star sub networks. The total system capacity is defined as the amount of these active compounds in one step and in the same direction.
Showing possible through bandwidths by RMT to all users in the Scenarios "star" and "subnet"



In Fig.. The dependence of the maximum throughput on the number of FMT in the script "Star"

In Fig. shows the results of the simulation scenario "star" when the number of FMT, whereas each line with an FMT RMT. If there is one FMT and one RMT received the maximum cross-cutting capacity (from AP to RMT) - roughly 14 M bit / sec. in physical mode, LCH, as given in Table 1. The maximum cross-cutting capacity was obtained from the model and calculated the total capacity in the presentation of the flow of exchange of the first and second stage of a single stream of data. Calculate the maximum throughput, taking into account the SF, where the estimated standard system H / 2.

Increasing the number of FMT, serving one RMT, greatly reduces the bandwidth of the connection AP-RMT, since it takes more and more capacity to provide information in SF. In the scenario of the sample (Fig) in six FMT value is reduced by approximately up to 3.5 M bit / sec. Simulation results supplemented counted capacities for the proposed structure of SF.



In Fig.. The dependence of the maximum throughput on the number of RMT in the script "subnet"

In Fig. 7 shows the simulation results for scenario subnet ranges where the number of RMT, are connected to one FMT. As expected, the increase in the number of RMT had no such dramatic effect that was observed in the script "star" with the increasing number of FMT. This becomes obvious if we understand that support for additional SF requires more resources (new F-BC, F-RCH, further delays for the entire SF) than support for an additional terminal in SF (this requires only minor additional costs in F-FCH and small additional delay for the F-DL and F-UL). In comparison with the system without the FMT [6], the number of RMT, supported by the frame H / 2 MAC, at a comparable capacity, approximately half the number of MT in the conventional plant, ie MT, supported in the first stage. These results are explained by the fact that cross-cutting data for the RMT to pass twice (to and from the FMT FMT) and thus there is a need to double the capacity of the system at the MAC.

2.4 MAC protocol

The basic frame structure on the air interface has a fixed duration of 2 ms and comprises fields for broadcast control, frame control, access feedback control, data transmission in the downlink and uplink, and random access. During direct-link communication, the frame contains an additional direct-link field (not shown in Figure). The duration of broadcast control is fixed, whereas the duration of other fields is dynamically adapted to the traffic situation. The broadcast channel (BCH), which contains control information that is sent in every MAC frame, mainly enables the control of radio resources. The frame channel FCH) contains an exact description of the allocation of resources within the current MAC frame. The access feedback channel ACH) conveys information on previous attempts at random access. Downlink or uplink traffic consists of data to or from mobile terminals. Traffic from multiple connections to or from a mobile terminal can be multiplexed onto one PDU train, where each connection contains 54-octet LCHs for data and 9-octet SCHs for control messages.HIPERLAN/2 supports multibeam antennas(sectors) as a means of improving the link budget and of reducing interference in the radio network. The resource request contains the number of pending PDUs in the mobile terminal for the particular DLC connection. Based on a slotted scheme, the mobile terminal can use contention slots to send the RR message. By varying the number of contention slots (random access channels, RCH), the access point can decrease access delay.
The MAC protocol is the protocol used for access to the medium (the radio link) with the resulting transmission of data onto that medium. The control is centralized to the AP which inform the MTs at which point in time in the MAC frame they are allowed to transmit their data, which adapts according to the request for resources from each of the MTs.

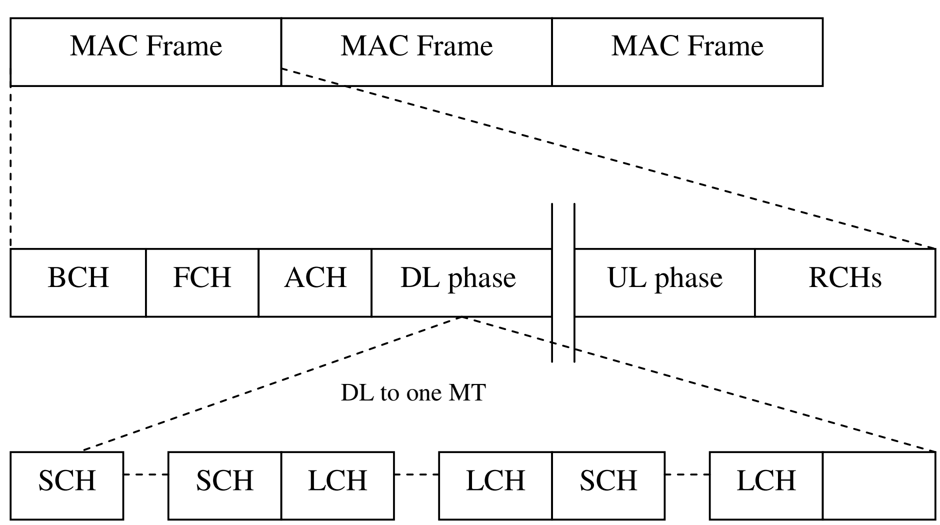


Figure MAC frame structure

One DLC connection

One PDU train (to be mapped on one PHY burst

3. Conclusions

Principle re -send presented for the systems H / 2, can expand the area covered by the standard radio cells H / 2, by introducing a new structure of the sub frame MAC, use a new element of H / 2, called the FMT, which performs a relay function for the MT, located outside the reach of the AP H / 2.
Presented SF uses division multiplexing in time to serve alternating first and second stage compounds, and is used so that the subnet to synchronize and FMT requires only one transceiver. Advances in communication cost deterioration in system capacity. Modifications to the existing standard H / 2, to support this principle, are minimized. Impact of the proposed principle for QoS have been shown in the results of simulation .

There will be a fight between connection and connectionless camps Hiperlan2/802.11a.
Current products under development and becoming available only offer 25Mbps.
Hiperlink 155Mbps data rates still some way off.
Wireless: Useful as an adjunct to the wired world. The standard is attractive since low cost devices can be developed for a system that enables high throughput with QoS support.
The standard has some key features like centralized control with QoS support, selective repeat ARQ, link adaptation, and dynamic frequency selection. HiperLAN2 can Interwork with different broadband core networks.

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The goal of the HiperLAN was the high data rate, higher than 802.11 The standard was approved in 1996

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