IEEE 802.4L

Through-the Air Physical Media, Radio

Running Objectives and Directives Document

Second issue

This document provides a base for the discussions of the IEEE 802.4L Working Group.
Each decision will be marked in this document along with the reference to the motion on which the decision has been based (column Base) and with the reference of the document on which the present decision is based (Doc no).
After each meeting a new document will be prepared to reflect the decisions made at the meeting.

Table of Contents

Subject	Base	Doc no
Scope		
To define an alternative Physical Layer for Through-the-air communication, which is part of a local area network using 802.4 media access techniques and which is primarily for mobile environments.	PAR	4L/87-014
Purpose		
To provide LAN access to moving automatic machines and other stations for which wireless attachment is appropriate.	PAR	4L/87-014
To add description of standards criteria for through-the-air transmission parameters to support Physical Layer Service.		
To prepare, if necessary, a petition to the FCC for rule making which authorizes use of radio spectrum for wireless LAN.		
Directions		
System plan		
The radio system plan for one community of users is proposed to be a dual frequency bus mode with head end, but will accomodate single frequency station-to-station operation for small systems. The physical layer including the head end and radio system shall support the existing 802.4 MAC. (Among other things, this implies that when any station is transmitting, all stations must hear something.)	Jan 89	4L/89-02
Whatever plan is evolved, it shall be suitable for use under current FCC part 15 regulations, in particular the three bands, 0.912 2.45, and 5.9 GHz.	Jul 88	
Modulation		
We will consider modulation methods and bandwidths which are within the frequency allocation and spectral power density limits of FCC 15.126.	Jul 88	
Differential Phase Modulation shall be used.	Nov 88/1	4L/88-02
Direct Sequence Spread Spectrum shall be used.	Nov 88/2	4L/88-02
For the spreading sequence at least 10 and not more than 15 chips shall be used. This provides a processing gain of between 10 and 15 allowing frequency division multiplexing of co-located LANs	Nov 88/3	4L/88-02
The following 11 chip sequence is considered for its good characteristics in corrolator output and frequency spectrum: 0 1 0 0 1 0 0 0 1 1 1.	Jan 89	4L/89-02
Data Rate		
The data rate for comparison purposes shall be 1 Mbit/s. We can only consider the IEEE data rates of 1 to 20 Mbit/s.	Jan 89	
Antenna		
The design model shall assume a 16 antenna array in a square grid. For purpose of analysis, it will be assumed that the antenna array is driven by one power splitter with equal length loss less cable from the splitter to each antenna.	Jul 88	

Subject	Base	Doc no

Directions (cont..d)

Definition of Bit Error Ratio

The working definitions are as follows:

* ndetectable frame errors must be below 1 in 10**15 frames.
* Undetected bit errors must be below 1 in 1*E9 bits
* Detected bit errors must be below 1 in 1*E8 bits

where:

- bits are to be read as bits transmitted between SD and ED,
- an undetected error is defined as a frame containing an FCS error (so may have been caused by a burst) and no bad signal reported.
- a detected error is defined as a frame containing 1 or more bad signal hits,
- the frame length being equal to the smallest frame used by the MAC.
- an undetectable frame error is defined as a frame in error that has no FCS error and no bad signal reported.

Bit Error Ratio

Jul 88

Since the radio medium is known to have a bit error ratio of the order 10E-3 the system shall incorporate the level of diversity and forward error coding required to support the detected error rate of 10E-8 and undetected error rate of 10E-9.

Outage

MAC protocol assumes the communication channel is always available. Since the radio medium is known to have an outage rate on the order of 10E-2, a method is required to reduce outage rate to less than 10E-5. Jul 88

Velocity ranges

The following are the ranges for the velocity of the stations: Jan 89

0.912 GHz	0 - 53.7 mph
2.45 GHz	0 - 20.0 mph
5.9 GHz	0 - 8.3 mph

Definable parameters

XMTR power output:	1 W max	Jan 89
Station antenna gain:	TBD	Jan 89
Station antenna directivity:	TBD	Jan 89
Receiver noise figure:	6 dB at 900 MHz	Jan 89
	8 dB at 2400 MHz	Jan 89
	10 dB at 5900 MHz	Jan 89

Subject	Base	Doc no

Directions (cont..d)

Error correction codes		
Allowable overhead:	1.2x	Jan 89
Type:	TBD	Jan 89
Spectral efficiency:	TBD	
Propagation		
Office/retail environment:	6 dB/octave under 10 meters	Jan 89
	11 dB/octave over 10 meters	Jan 89
Factory environment:	TBD	Jan 89
Delay spread parameter	TBD	
S/N minimum:	TBD	
Noise:		Jan 89
at .9 GHz	10 dB above thermal	
at 2.5 GHz	thermal	Jan 89
Antenna		
If the antenna is located 7 to 10 feet above ground it has 25 dB antenna gain over an antenna in a pocket.		Jan 89

Meeting Plan

Type	Dates	Place	Objective
Plenary	Mar 20-24, 89	New Orleans 1 half day	Medium Characteristics Document Lay-out
Interim	May 22- 24, 89	Atlanta	Prepare first draft
Plenary	Jul 10-14, 89	Vancouver	Draft 1 to 802.4
Interim	Sep 4- 6, 89	?	Next draft
Plenary	Nov 6-10, 89	Ft Lauderdale	Draft 2 to 802.4
Interim	Jan - , 90	?	Next draft
Plenary	Mar 12-16, 90	Newport Beach	802.4 Voting draft
Interim	May - , 90	?	Prepare TCCC draft
Plenary	Jul 9-13, 90	Denver (CO)	TCCC voting draft
Interim	Sep - , 90	?	Last comment
Plenary	Nov 12-16, 90	Phoenix	Final Draft out

Possible Document Outline

20. Radio Bus Physical Layer

- 20.1 Nomenclature
- 20.2 Object
- 20.3 Compatibility Considerations
- 20.4 Operational Overview Single Frequency System
- 20.5 Operational Overview Dual Frequency System
- 20.6 General Overview
- 20.7 Application of Network Management
- 20.8 Functional, Electrical and Mechanical Specifications
- 20.9 Environmental Specifications

21. Radio Bus Medium

- 21.1 Nomenclature
- 21.2 Object
- 21.3 Compatibility Considerations
- 21.4 General Overview
- 21.5 Functional, Electrical and Mechanical Specifications
- 21.6 Environmental Specifications
- 21.7 Transmission Path Delay Considerations
- 21.8 Documentation
- 21.9 Network Sizing
- 21.10 Guidelines

Issues

1 Is a Bit Error Ratio (BER) of 10**-8 detected and 10**-9 achievable with operation with a dual frequency head-end distribution system.

2 Is the BER described in issue 1 achievable for direct station-to-station operation and what is the condition to achieve this BER.

3 What Forward Error Correcting Code (FEC) is suited for channels with burst errors characteristics.

4 Considering the agreement that non-data will not be encoded as a PHY symbol: Find a method of start and end delimeter encoding, e.g. use a combination of an alternative constellation and corolation.