INTERNATIONAL STANDARD

ISO/IEC 9314-8

First edition
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Information technology –
Fibre Distributed Data Interface (FDDI) –

Part 8:
Media Access Control-2 (MAC-2)

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CONTENTS

Page

FOREWORD v

INTRODUCTION vi

Clause

1 Scope 1

2 Normative references 3

3 Definitions 4

4 Conventions and abbreviations 7
4.1 Conventions 7
4.1.1 Addressing 7
4.1.2 Timing values and timers 7
4.2 Abbreviations 8

5 General description 10

6 Services 11
6.1 MAC-to-LLC services 12
6.1.1 MA_UNITDATA.request 12
6.1.2 MA_UNITDATA.indication 14
6.1.3 MA_UNITDATA_STATUS.indication 16
6.1.4 MA_TOKEN.request 16
6.2 MAC-to-PHY services 17
6.2.1 PH_UNITDATA.request 18
6.2.2 PH_UNITDATA.indication 18
6.2.3 PH_INVALID.indication 18
6.3 MAC-to-H-MUX Services 19
6.3.1 HM_MODE.indication 19
6.3.2 HP_UNITDATA.request 20
6.3.3 HP_UNITDATA.indication 20
6.3.4 HP_INVALID.indication 21
6.3.5 HP_MODE.request 21
6.4 MAC-to-SMT services 22
6.4.1 SM_MA_INITIALIZE_PROTOCOL.request 22
6.4.2 SM_MA_CONTROL.request 24
6.4.3 SM_MA_STATUS.indication 26
6.4.4 SM_MA_UNITDATA.request 28
6.4.5 SM_MA_UNITDATA.indication 29
6.4.6 SM_MA_UNITDATA_STATUS.indication 31
6.4.7 SM_MA_TOKEN.request 31

7 Facilities 32
7.1 Symbol set 32
7.1.1 Line state symbols 32
7.1.2 Control symbols 33
7.1.3 Data Quartets (0-F) 34
7.1.4 Violation symbol (V) 34

7.2 Protocol Data Units 34
7.2.1 Token 35
7.2.2 Frame 35
7.3 Fields 36
7.3.1 Preamble (PA) 36
7.3.2 Starting Delimiter (SD) 36
7.3.3 Frame Control (FC) 36
7.3.4 Destination and source addresses 39
7.3.5 Routing Information (RI) field 42
7.3.6 Information (INFO) field 42
7.3.7 Frame Check Sequence (FCS) 43
7.3.8 Ending Delimiter (ED) 44
7.3.9 Frame Status (FS) 45
7.4 Timers 46
7.4.1 Token-Holding Timer (THT) 46
7.4.2 Valid-Transmission Timer (TVX) 46
7.4.3 Token-Rotation Timer (TRT) 47
7.4.4 Late Counter (Late_ct) 48
7.4.5 Token Counter (Token_ct) 48
7.5 Frame counts 48
7.5.1 Frame_ct 48
7.5.2 Error_ct 48
7.5.3 Lost_ct 48
7.5.4 Copied_ct 49
7.5.5 Transmit_ct 49
7.5.6 Not_Copied_ct 49

8 Operation 49
8.1 Overview 49
8.1.1 Frame transmission 50
8.1.2 Token transmission 50
8.1.3 Frame stripping 50
8.1.4 Ring scheduling 51
8.1.5 Ring monitoring 53
8.2 Structure 55
8.3 Receiver 56
8.3.1 Token and frame validity criteria 57
8.3.2 State R0: LISTEN 58
8.3.3 State R1: AWAIT_SD (Await Starting Delimiter) 58
8.3.4 State R2: RC_FR_CTRL (Receive Frame Control Field) 59
8.3.5 State R3: RC_FR_BODY (Receive Frame Body) 60
8.3.6 State R4: RC_FR_STATUS (Receive Frame Status) 62
8.3.7 State R5: CHECK_TK (Check Token) 64
8.4 Transmitter 65
8.4.1 State T0: TX_IDLE (Transmitter Idle) 65
8.4.2 State T1: REPEAT (Repeat) 67
8.4.3 State T2: TX_DATA (Transmit data) 69
8.4.4 State T3: ISSUE_TK (Issue Token) 71
8.4.5 State T4: CLAIM_TK (Claim Token) 72
8.4.6 State T5: TX_BEACON (Transmit Beacon) 73

Annex A (informative) Addressing 83
A.1 General structure 83
A.2 Administration of addresses 83
A.2.1 Locally administered addresses 84
A.2.2 Universally administered addresses 84
A.3 Transmission order 85
A.3.1 Representation of addresses 85
A.4 Group addresses 86
A.4.1 Broadcast address 86
A.4.2 Assignment of group addresses for use in standards 87
A.4.3 Group addresses assigned for use in FDDI 87
A.5 Source routing addressing 87
A.6 References 87
Annex B (informative) Frame Check Sequence 88
B.1 Description 88
B.2 Generation of the FCS 88
B.3 Checking the FCS 89
B.4 Implementation 89
B.5 Related standards 91
Annex C (informative) Bridging 92
C.1 Bridge architectures 92
C.2 Destination Address recognition 93
C.3 Indicator setting 93
C.4 Stripping 93
Annex D (informative) Elements of timer calculation 95
Annex E (informative) Bibliography 98

Tables

Table 1 – Interpretation of FC field 59

Figures

Figure 1 – FDDI structure 3
Figure 2 – Token ring logical configuration example 11
Figure 3 – MAC Receiver state diagram 75
Figure 4 – MAC Transmitter state diagram 79
Figure B.1 – FCS implementation example 90

FOREWORD

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 9314-8 was prepared by Joint Technical Committee ISO/IEC JTC 1 *Information technology*, Subcommittee SC 25*, Interconnection of information technology equipment.*

ISO/IEC 9314 consists of the following parts, under the general title *Information technology – Fibre Distributed Data Interface (FDDI):*

– *Part 1: Token Ring Physical Layer Protocol (PHY) (1989)*

– *Part 2: Token Ring Media Access Control (MAC) (1989)*

– *Part 3: Physical Layer Medium Dependent (PMD) (1990)*

– *Part 4: Single Mode Fibre Physical Layer Medium Dependent (SMF-PMD)* [1)]

– *Part 5: Hybrid Ring Control (HRC) (1995)*

– *Part 6: Station Management (SMT)*

– *Part 7: Physical Layer Protocol (PHY-2)*

– *Part 8: Media Access Control-2 (MAC-2)*

– *Part 9: Low-Cost Fibre – Physical Medium Dependent (LCF-PMD) (under consideration)*

– *Part 10: Token Ring Twisted Pair Physical layer Medium Dependent (TP-PMD) (under consideration)*

– *Part 13: Conformance Test Protocol Implementation Conformance Statement Proforma (CT-PICS)*

– *Part 20: Physical Medium Dependent Conformance Testing (PMD-ATS) (under consideration)*

– *Part 21: Physical Layer Protocol Conformance Testing (PHY-ATS) (under consideration)*

– *Part 25: Abstract test suite for FDDI – Station Management Conformance Testing (SMT-ATS)*

– *Part 26: Media Access Control Conformance Testing (MAC-ATS) (under consideration)*

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1) To be published

INTRODUCTION

The Fibre Distributed Data Interface (FDDI), ISO/IEC 9314, is intended for use in a high-performance general purpose multi-node network and is designed for efficient operation with a peak data rate of 100 Mbit/s. It uses a Token Ring architecture with optical fibre as the transmission medium. FDDI provides for hundreds of nodes operating over an extent of tens of kilometres.

The Media Access Control (MAC) specifies the lower sublayer of the Data Link Layer for the FDDI. As such, it presents the specifications and services provided for conforming FDDI attachment devices. MAC specifies the access to the medium, including addressing, data checking, and data framing. MAC also specifies the receiver and transmitter state machines.

When the set of basic FDDI standards, ISO/IEC 9314, is completed it will include the following standards:

a) A Physical Layer Protocol (PHY), which specifies the upper sublayer of the Physical Layer of ISO/IEC 9314.

b) A Physical Layer Media Dependent (PMD), which specifies the lower sublayer of the Physical Layer of ISO/IEC 9314.

c) A Station Management (SMT), which specifies the local portion of the system management application process of ISO/IEC 9314.

A number of extensions to ISO/IEC 9314 are completed or in process. One extension, ISO/IEC 9314-5, for Hybrid Ring Control (HRC), commonly known as FDDI-II, extends the capability of FDDI to handle isochronous data streams at a multiplicity of data rates. Another extension, ISO/IEC 9314-4, provides for a single-mode optical fibre version of PMD (SMF-PMD) and will permit optical links of up to 60 km.

Other work, addressing alternate PMDs, is aimed at providing low-cost attachments for use in concentrator-to-workstation environments. This work includes a Low-Cost Fibre PMD (LCF-PMD) and a (copper) Twisted Pair PMD (TP-PMD).

This part of ISO/IEC 9314 for MAC-2 is an enhancement to the original FDDI standard on MAC (ISO 9314-2). It is referred to as MAC-2 when it is necessary to distinguish it from the original MAC. Changes include those identified in footnotes to ISO 9314-2 as areas that the standards committee intended to change as well as changes that were required for extensions to FDDI, such as FDDI-II and MAC level bridging. MAC-2 also includes editorial corrections and clarifications.

INFORMATION TECHNOLOGY — FIBRE DISTRIBUTED DATA INTERFACE (FDDI) —

Part 8: Media Access Control-2 (MAC-2)

1 Scope

This part of ISO/IEC 9314 specifies the Media Access Control (MAC), the middle sublayer of the Data Link Layer (DLL), for Fibre Distributed Data Interface (FDDI).

FDDI (ISO/IEC 9314) provides a high-bandwidth (100 Mbit/s), general-purpose interconnection among information processing systems, subsystems and peripheral equipment, using fibre optics or other transmission media. FDDI can be configured to support a sustained data transfer rate of at least 80 Mbit/s (10 Mbyte/s). FDDI provides connectivity for many nodes distributed over distances of many kilometres in extent. Certain default parameter values for FDDI (e.g. timer settings) are calculated on the basis of up to 1 000 transmission links or up to 200 km total fibre path length (typically corresponding to 500 nodes and 100 km of dual fibre cable, respectively); however, the FDDI protocols can support much larger networks by increasing these parameter values.

As shown in figure 1, ISO/IEC 9314 consists of

a) A Physical Layer (PL), which is divided into two sublayers:

   1) A Physical Medium Dependent (PMD), which provides the digital baseband point-to-point communication between nodes in the FDDI network. The PMD provides all services necessary to transport a suitably coded digital bit stream from node to node. The PMD defines and characterizes the fibre-optic drivers and receivers, medium-dependent code requirements, cables, connectors, power budgets, optical bypass provisions, and physical-hardware-related characteristics. It specifies the point of interconnectability for conforming FDDI attachments. The initial PMD standard, ISO/IEC 9314-3, defines attachment to multi-mode fibre. Additional PMD sublayer standards are being developed for attachment to single-mode fibre and SONET.

   2) A Physical Layer Protocol (PHY), which provides connection between the PMD and the Data Link Layer. PHY establishes clock synchronization with the upstream code-bit data stream and decodes this incoming code-bit stream into an equivalent symbol stream for use by the higher layers. PHY provides encoding and decoding between data and control indicator symbols and code bits, medium conditioning and initializing, the synchronization of incoming and outgoing code-bit clocks, and the delineation of octet boundaries as required for the transmission of information to or from higher layers. Information to be transmitted on the medium is encoded by the PHY using a group transmission code.

b) A Data Link Layer (DLL), which is divided into two or more sublayers:

   1) An optional Hybrid Ring Control (HRC), which provides multiplexing of packet and circuit switched data on the shared FDDI medium. HRC comprises two internal components, a Hybrid Multiplexer (H-MUX) and an isochronous MAC (I-MAC). H-MUX maintains a synchronous 125 µs cycle structure and multiplexes the packet and circuit switched data streams, and I-MAC provides access to circuit switched channels.

2) A Media Access Control (MAC), which provides fair and deterministic access to the medium, address recognition, and generation and verification of frame check sequences. Its primary function is the delivery of packet data, including frame generation, repetition, and removal. The definition of MAC is contained in this part of ISO/IEC 9314.

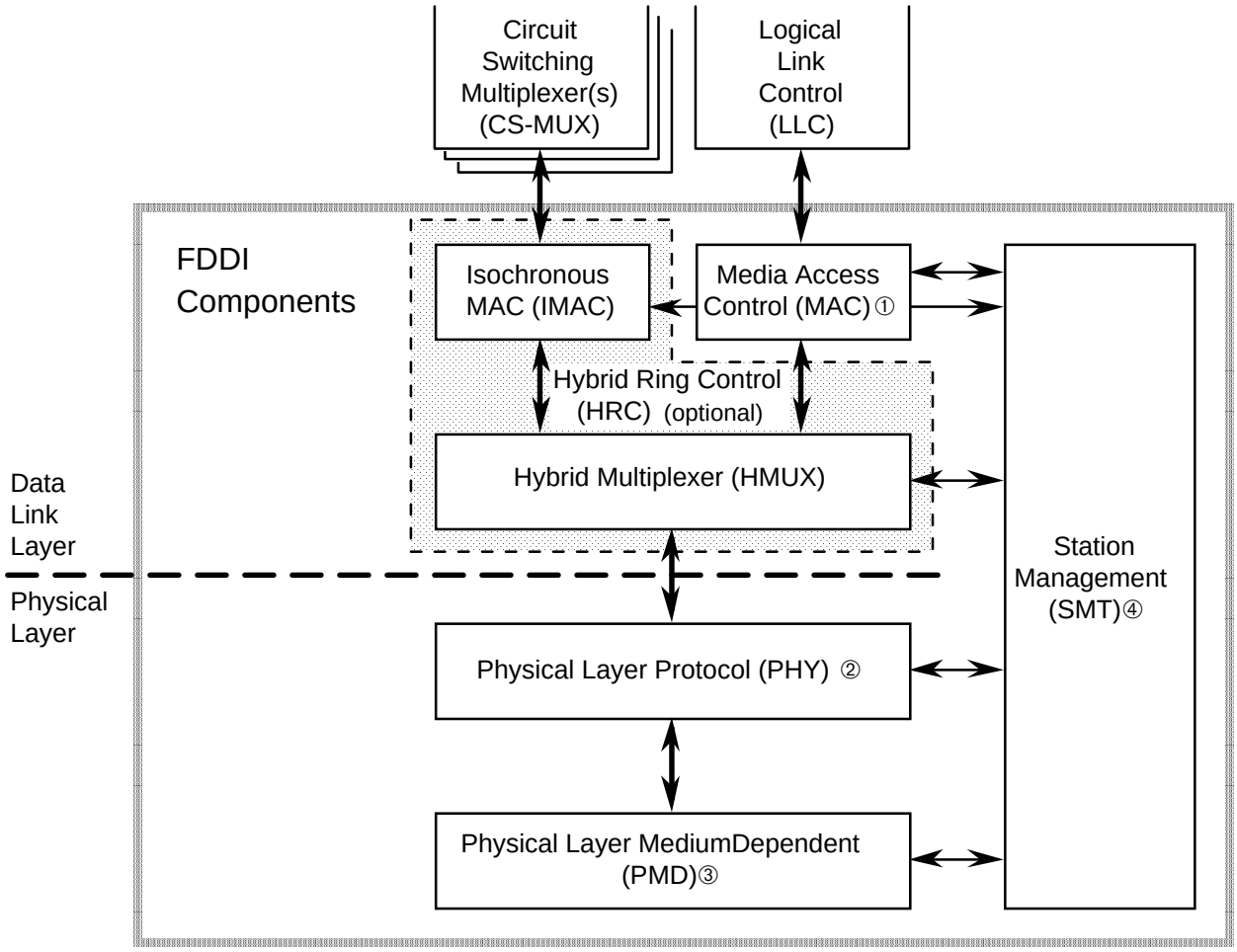
3) An optional Logical Link Control (LLC), which provides a common protocol for any required packet data adaptation services between MAC and the Network Layer. LLC is not specified by FDDI.

4) An optional Circuit Switching Multiplexer (CS-MUX), which provides a common protocol for any required circuit data adaptation services between I-MAC and the Network Layer. CS-MUX is not specified by FDDI.

c) A Station Management (SMT), which provides the control necessary at the node level to manage the processes under way in the various FDDI layers such that a node may work cooperatively on a ring. SMT provides services such as control of configuration management, fault isolation and recovery, and scheduling policies.

The MAC definition contained herein is designed to be as independent as possible from both the physical medium and the speed of operation. Concepts employed in ISO/IEC 8802-5, dealing with Token Ring MAC operation have been modified to accommodate the higher FDDI speeds, while retaining a similar set of services and facilities.

ISO/IEC 9314 specifies the interfaces, functions, and operations necessary to ensure interoperability between conforming FDDI implementations. This part of ISO/IEC 9314 provides a functional description. Conforming implementations may employ any design technique that does not violate interoperability. Implementations that conform to this part of ISO/IEC 9314 shall also be interoperable with implementations that conform to ISO 9314-2 if the additional capability of hybrid mode operation (as defined in this document) is not being used. Implementers are encouraged to consult ISO 9314-2 in addition to this part of ISO/IEC 9314.



① MAC-2 with HRC; MAC or MAC-2 otherwise.

② PHY-2 with HRC; PHY or PHY-2 otherwise.

③ PMD, SMF-PMD, TP-PMD or LCF-PMD.

④ SMT-2 with HRC; SMT or SMT-2 otherwise.

Figure 1 – FDDI structure

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 9314. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 9314 are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/IEC 8802-2: 1994, *Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 2: Logical link control*

ISO/IEC 8802-5: 1992, *Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 5: Token ring access method and physical layer specifications*

ISO 9314-1: 1989, *Information processing systems - Fibre Distributed Data Interface (FDDI) - Part 1: Token Ring Physical Layer Protocol (PHY)*

ISO 9314-2: 1989, *Information processing systems - Fibre Distributed Data Interface (FDDI) - Part 2: Token Ring Media Access Control (MAC)*

ISO/IEC 9314-3: 1990, *Information processing systems – Fibre Distributed Data Interface (FDDI) – Part 3: Physical Layer Medium Dependent (PMD)*

ISO/IEC 9314-4, *Information technology – Fibre Distributed Data Interface (FDDI) – Part 4: Single Mode Fibre Physical Layer Medium Dependent (SMF-PMD)* [1)]

ISO/IEC 9314-5:1995, *Information technology - Fibre Distributed Data Interface (FDDI) - Part 5: Hybrid Ring Control (HRC)*

ISO/IEC 9314-6: *Information technology - Fibre Distributed Data Interface (FDDI) - Part 6: Station Management (SMT)*

ISO/IEC 9314-7: *Information technology - Fibre Distributed Data Interface (FDDI) - Part 7: Physical Layer Protocol (PHY-2)*

ISO/IEC 10038: 1993, *Information technology - Telecommunications and information exchange between systems - Local area networks - Media access control (MAC) bridges*

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1) To be published.