SLOVENSKI STANDARD
SIST EN 29314-2:1997

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

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Informationsverarbeitungssysteme - Verteilte Datenschnittstelle mit Lichtwellenleitern (FFDI) - Teil 2: Steuerungsverfahren für den Mediumzugriff des Ringes mit Sendeberechtigungsmarke (MAC) (ISO 9314-2:1989)

Systemes de traitement de l'information - Interface de données distribuées sur fibre (FFDI) - Partie 2: Mécanisme d'acces au support de l'anneau a jeton (MAC) (ISO 9314-2:1989)

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

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This European Standard was approved by CEN on 1993-10-20. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

The European Standards exist in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Foreword

On the proposal of the CEN Central Secretariat, the Technical Board decided to submit the International Standard:

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

to the formal vote.

The result of the formal vote was positive.

For the time being, this document exists only in English.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 1994, and conflicting national standards shall be withdrawn at the latest by April 1994.

In accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard:

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

Endorsement notice

The text of the International Standard ISO 9314-2:1989 was approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

ISO 9314-2

First edition
1989-05-01

Information processing systems — Fibre Distributed Data Interface (FDDI) —

Part 2 : Token Ring Media Access Control (MAC)

Systèmes de traitement de l'information — Interface de données distribuées sur fibre (FDDI) —

Partie 2 : Mécanisme d'accès au support de l'anneau à jeton (MAC)

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Contents

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 9314-2 was prepared by Technical Committee ISO/TC 97, *Information processing systems.*

ISO 9314 consists of the following parts, under the general title *Information processing systems — Fibre Distributed Data Interface (FDDI)* —

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

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

— *Part 3: Token Ring Physical Layer, Medium Dependent (PMD)*

Introduction

This part of ISO 9314 on the FDDI media access control is intended for use in a high-performance multistation network. This protocol is designed to be effective at 100 Mbit/s using a Token ring architecture and fibre optics as the transmission medium over distances of several kilometres in extent.

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Information processing systems - Fibre Distributed Data Interface (FDDI) -

Part 2:
Token Ring Media Access Control (MAC)

1 Scope

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

FDDI provides a high-bandwidth (100 Mbit/s), general-purpose interconnection among computers and peripheral equipment using fibre optics as the transmission medium in a ring configuration. FDDI can be configured to support a sustained transfer rate of approximately 80 Mbit/s (10 Mbyte/s). It may not meet the response time requirements of all unbuffered high speed devices. FDDI establishes the connection among many stations distributed over distances of several kilometres in extent. Default values for the FDDI were calculated to accommodate rings of up to 1 000 physical links and a total fibre path length of 200 km (typically corresponding to 500 stations and 100 km of dual fibre cable).

FDDI consists of

(a) A Physical Layer (PL), which provides the medium, connectors, optical bypassing, and driver/receiver requirements. PL also defines encode/decode and clock requirements as required for framing the data for transmission on the medium or to the higher layers of the FDDI. For purposes of this part of 9314, references to the PL are made in terms of the Physical Layer entity designated PHY.

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

(1) 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 frames, including frame insertion, repetition, and removal. The definition of MAC is contained in this part of ISO 9314.

(2) A Logical Link Control (LLC) which provides a common protocol to provide the required data assurance services between MAC and the Network Layer.

(c) A Station Management (SMT)[1] which provides the control necessary at the station level to manage the processes under way in the various FDDI layers such that a station may work co-operatively on a ring. SMT provides services such as control of station initialization, configuration management, fault isolation and recovery, and scheduling procedures.

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[1] SMT will form the subject of a future part of ISO 9314.

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

ISO 9314 specifies the interfaces, functions, and operations necessary to ensure interoperabili between conforming FDDI implementations. This part of ISO 9314 provides a function description. Conforming implementations may employ any design technique that does n violate interoperability.

2 Normative references

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

ISO 8802-2: ----[1], *Information processing systems – Local Area Networks – Part 2: Logic Link Control (LLC).*

ISO 8802-5: ----[1], *Information processing systems – Local Area Networks – Part 5: Tok Ring Access Method and Physical Layer specification.*

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

ISO 9314-3: ----[1], *Information processing systems – Fibre Distributed Data Interface (FDDI) Part 3: Token Ring Physical Layer, Medium Dependent (PMD).*

3 Definitions

For the purposes of this part of ISO 9314, the following definitions apply:

3.1 asynchronous: A class of data transmission service whereby all requests for servic contend for a pool of dynamically allocated ring bandwidth and response time.

3.2 capture: The act of removing a Token from the ring for the purpose of Fran transmission.

3.3 claim token: A process whereby one or more stations bid for the right to initialize tl ring.

3.4 entity: An active functional agent within an Open System Interconnection (OSI) layer sublayer, including both operational and management functions.

3.5 fibre optics: The technology whereby optical signals from light-generating transmitters a propagated through optical fibre waveguides to light-detecting receivers.

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[1] To be published.

3.6 frame: A PDU transmitted between co-operating MAC entities on a ring, consisting of a variable number of octets and control symbols.

3.7 Media Access Control (MAC): The Data Link Layer responsible for scheduling and routing data transmissions on a shared medium Local Area Network (e.g., an FDDI ring).

3.8 nonrestricted token: A Token denoting the normal mode of asynchronous bandwidth allocation, wherein the available bandwidth is time-sliced among all requesters.

3.9 octet: A data unit composed of eight ordered bits (a pair of data symbols).

3.10 Physical (PHY): The Physical Layer responsible for delivering a symbol stream produced by an upstream MAC Transmitter to the logically adjacent downstream MAC Receiver in an FDDI ring.

3.11 physical connection: The full-duplex physical layer association between adjacent physical layer entities (in concentrators, repeaters, or stations) in an FDDI ring.

3.12 primitive: An element of the service interface presented by an entity.

3.13 Protocol Data Unit (PDU): The unit of data transfer between communicating peer layer entities. It may contain control information, address information, data (e.g., an SDU from a higher layer entity), or any combination of the three. The FDDI MAC PDUs are Tokens and Frames.

3.14 receive: The action of a station in accepting a Token, Frame, or other symbol sequence from the incoming medium.

3.15 repeat: The action of a station in receiving a Token or Frame from the adjacent upstream station and simultaneously sending it to the adjacent downstream station. The FDDI MAC may repeat received PDUs (Tokens and Frames), but does not repeat the received symbol stream between PDUs. While repeating a Frame, MAC may copy the data contents and modify the control indicators as appropriate.

3.16 restricted token: A Token denoting a special mode of asynchronous bandwidth allocation, wherein the bandwidth available for the asynchronous class of service is dedicated to a single extended dialogue between specific requesters.

3.17 ring: Two or more stations connected by a physical medium wherein information is passed sequentially between active stations, each station in turn examining or copying and repeating the information, finally returning it to the originating station.

3.18 Service Data Unit (SDU): The unit of data transfer between a service user and a service provider.

3.19 services: A set of functions provided by one OSI layer sublayer entity, for use by a higher layer or sublayer entity or by management entities.

3.20 station: An addressable logical and physical attachment in a ring, capable of transmitting, receiving, and repeating information. An FDDI station has one or more PHY entities, one or more MAC entities, and one SMT entity.

3.21 Station Management (SMT): The supervisory entity within an FDDI station that monitors and controls the various FDDI entities including PMD, MAC, and PHY.

3.22 symbol: The smallest signalling element used by MAC, i.e., the PHY SDU. The symb set consists of 16 data symbols and 8 control symbols. Each symbol maps to a speci sequence of five code bits as transmitted by the Physical Layer.

3.23 synchronous: A class of data transmission service whereby each requester preallocated a maximum bandwidth and guaranteed a response time not to exceed a speci delay.

3.24 token: An explicit indication of the right to transmit on a shared medium. On a Tok Ring, the Token circulates sequentially through the stations in the ring. At any time, it may held by zero or one station. FDDI uses two classes of Tokens: restricted and nonrestricte

3.25 transmit: The action of a station in generating a Token, Frame, or other symb sequence and placing it on the outgoing medium.

4 Conventions and abbreviations

4.1 Conventions

The terms SMT, MAC, LLC, and PHY, when used without modifiers, refer specifically to t local entities. The term LLC unless otherwise qualified refers to any local user of MAC da services, other than SMT, including ISO 8802-2.

Low lines (e.g., requested_service_class) are used as a convenience to mark the name signals, functions, etc., that might otherwise be misinterpreted as independent individual words they were to appear in text.

The use of a period (e.g., MA_UNITDATA.request) is equivalent to the use of low lines exce that a period is used as an aid to distinguish modifier words appended to an antecede expression.

4.1.1 Addressing

my short address (MSA): 16-bit Individual Address of this station (0 = Null).

my long address (MLA): 48-bit Individual Address of this station (0 = Null). If a stati does not implement 48-bit addressing then MLA=0.

short addresses: Set of 16-bit station Addresses including MSA if not Null, the 16-l Broadcast Address (all ones), and any other 16-bit Group Addresses recognized by this stati

long addresses: Set of 48-bit Station Addresses including MLA if not Null, the 48-l Broadcast Address (all ones), and any other 48-bit Group Addresses recognized by tl station.

If a station does not implement 48-bit addressing, then MLA = 0.

When claiming the Token (i.e., the transmitter is in Claim Token state), if the station transm with 16-bit addressing, then MLA = 0; conversely, if the station transmits with 48-l addressing, then MSA = 0.

4.1.2 Timing values and timers:

All timing values are expressed as the unsigned twos complements of the target, or remaining, time in octets, i.e., the numerically greater magnitude represents the shortest time remaining. This definition is for reference purposes only and does not prescribe the implementation, except where these timing values appear in Protocol Data Units on the ring. These timing values are not all used simultaneously in the state machines; consequently, the implementation need not materialize them when they are not needed.

For the purpose of the description contained in this part of ISO 9314, all timers are assumed to be initialized with the unsigned twos complement of the target, or remaining, time in octets. Timers are further assumed to count upward if enabled, expiring when an overflow occurs. All timer comparisons are expressed on the basis of elapsed time. These conventions are only for the convenience of documenting this part of ISO 9314 and do not prescribe implementation.

4.2 Abbreviations

Error_Ct	Count of reportable frame errors
Frame_Ct	Count of all frames received
Late_Ct	Count of TRT expirations (Token Lateness)
Lost_Ct	Count of PDUs detected as lost
A_Flag	Indicates Destination Address match in last received frame
C_Flag	Indicates successful copying of last received frame
E_Flag	Indicates error detected in last received frame
H_Flag	Indicates Higher Source Address received
L_Flag	Indicates Lower Source Address received
M_Flag	Indicates My Source Address received
N_Flag	Indicates next station addressing
R_Flag	Indicates the Token_class of the last valid Token received was restricted
A_Max	Maximum signal acquisition time
D_Max	Maximum ring latency time
F_Max	Maximum frame time
I_Max	Maximum station physical insertion time
L_Max	Maximum Transmitter Frame set-up time
M_Max	Maximum number of MAC entities allowed on the ring
S_Min	Minimum safety timing allowance
T_Bid_Rc	Bidding TTRT received by this station in Claim Frames
T_Bid_Tx	Bidding TTRT transmitted in this station's Claim Frames
T_Init	Ring initialization time
T_Max	Maximum TTRT to be supported by this station
T_Min	Minimum TTRT to be supported by this station
T_Neg	Negotiated TTRT during Claim process (in receiver)
T_Opr	Operative TTRT for this station (in transmitter)
T_Pri	Set of n priority Token rotation time thresholds
T_Pri(n)	Element n of the set T_Pri
T_React	Worst Case time to react to a station insertion or removal
T_Req	Requested TTRT for this station's synchronous traffic
T_Resp	Worst case time to recover a Token
THT	Token-Holding Timer
TRT	Token-Rotation Timer
TTRT	Target Token Rotation Time
TVX	Valid-Transmission Timer