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Information technology — High-Performance Parallel Interface —

Part 3:

Encapsulation of ISO/IEC 8802-2 (IEEE Std 802.2)
Logical Link Control Protocol Data Units (HIPPI-LE)

Technologies de l'information — Interface parallèle à haute performance —

*Partie 3: Encapsulation de l'ISO/CEI 8802-2 (IEEE Std 802.2) unités de
données du protocole de contrôle de liaison logique (HIPPI-LE)*



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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 11518-3 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology, Subcommittee SC 25, Interconnection of information technology equipment*.

ISO/IEC 11518 consists of the following parts, under the general title *Information technology – High-Performance Parallel Interface*:

- Part 1: Mechanical, electrical, and signalling protocol specification (HIPPI-PH)
- Part 2: Framing Protocol (HIPPI-FP)
- Part 3: Encapsulation of ISO/IEC 8802-2 (IEEE Std 802.2) Logical Link Control Protocol Data Units (HIPPI-LE)
- Part 4: Mapping of HIPPI to IPI device generic command sets (HIPPI-IPI)
- Part 5: Memory Interface (HIPPI-MI)
- Part 6: Physical Switch Control (HIPPI-SC)

Annexes A and B of this part of ISO/IEC 11518 are for information only.

Introduction

This part of ISO/IEC 11518 defines the HIPPI-LE Protocol Data Unit (PDU) format and interface for transporting ISO/IEC 8802-2 Logical Link Control PDUs over HIPPI.

Characteristics of this HIPPI-LE include

- Encapsulation of arbitrary Protocol Data Units that conform to ISO/IEC 8802-2 Logical Link Control;
- Provision for 48-bit source and destination addresses conforming to ISO/IEC 8802-1;
- Provision for eight forwarding classes to distinguish, for example, among ordinary data PDUs, PDUs for services that require bandwidth guarantees such as packet video, etc.

Figure 1 shows the relationship of this part of ISO/IEC 11518 (in the solid rectangle) with the other entities shown.

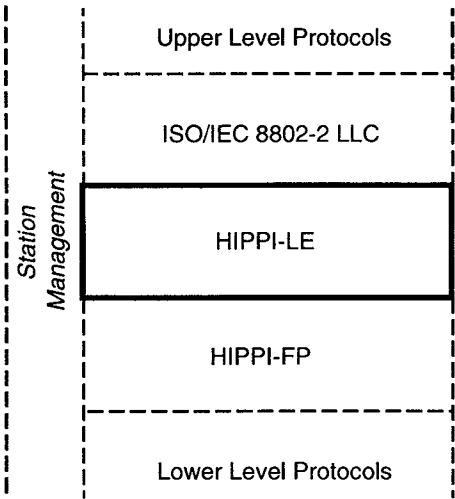


Figure 1 – Protocol hierarchy

Information technology – High-Performance Parallel Interface –

Part 3: Encapsulation of ISO/IEC 8802-2 (IEEE Std 802.2) Logical Link Control Protocol Data Units (HIPPI-LE)

1 Scope

This part of ISO/IEC 11518 provides a common method for encapsulating ISO/IEC 8802-2 Logical Link Control Protocol Data Units (PDU) on HIPPI.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 11518. 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 11518 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/IEC 8802-1:1994 *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 1: Overview of Local Area Network 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 11518-2:1996 *Information technology – High-Performance Parallel Interface – Part 2: Framing Protocol (HIPPI-FP).*

3 Definitions and conventions

3.1 Definitions

For the purposes of this part of ISO/IEC 11518, the definitions in ISO/IEC 11518-1 and the following definitions apply.

3.1.1 ISO/IEC 8802-2 LLC PDU: A PDU formatted according to ISO/IEC 8802-2 Logical Link Control.

3.1.2 Address Resolution: The general process of discovering the low-level (or switch) address associated with a known higher level address for a particular remote entity. This involves sending a query message, containing the known higher level address, to a well-known switch address. The requester receives a reply containing the associated switch address.

3.1.3 Address Resolution Protocol (ARP): the particular protocol for address resolution used by the Internet.

3.1.4 HIPPI-LE PDU: A PDU that includes a HIPPI-LE header and an ISO/IEC 8802-2 LLC PDU and is formatted according to clause 6.

3.1.5 optional: A term referring to features that are not required by this part of ISO/IEC 11518. However, if any optional feature defined by this part of ISO/IEC 11518 is implemented, it shall be implemented according to this part of ISO/IEC 11518.

3.1.6 protocol data unit (PDU): A formatted data set that is a logical unit of interchange between entities.

3.1.7 service data unit (SDU): A formatted data set that includes a PDU and optional information for the convenience of an implementer.

3.1.8 station management (SMT): The supervisory entity that monitors and controls HIPPI.

3.1.9 Switch Address: A value in the switch hardware domain which selects the route or end point of a HIPPI connection. The range and format depend on switch hardware. HIPPI-SC specifies two formats: Logical Address (12 bits) and Source Route (24 bits).

3.2 Editorial conventions

In this part of ISO/IEC 11518, certain terms that are proper names of service primitives, or similar terms are printed in upper case to avoid possible confusion with other uses of the same words (e.g., TRANSFER). Any lower case uses of these words have the normal technical English meaning.

The first letter of each word of service parameters, service primitive types, and similar terms is capitalized (e.g., Destination_Address, Status, Request). Any lower case uses of these words have the normal technical English meaning.

4 HIPPI-LE services to ISO/IEC 8802-2 LLC

This clause specifies the services provided by HIPPI-LE. The intent is to allow ISO/IEC 8802-2 LLC to operate correctly with HIPPI-LE. How many of the services described in this clause are chosen for a given implementation is up to the implementer; however, the set of HIPPI-LE services supplied shall be sufficient to satisfy the higher level protocol(s) being used. Service parameters are also optional and additional parameters not shown may be used as necessary. The services as defined in this part of ISO/IEC 11518 do not imply any particular implementation, or any interface.

In this part of ISO/IEC 11518 the ISO/IEC 8802-2 LLC and station management protocol (SMT) are service users, and the HIPPI-LE is the service provider to the ISO/IEC 8802-2 LLC and SMT. The primitives to ISO/IEC 8802-2 LLC are prefixed with LE_ and the SMT primitives are prefixed with LESM_.

The HIPPI-LE is also the service user of HIPPI-FP services, which are prefixed with FP_.

Figure 2 shows the relationship of the services provided by and used by HIPPI-LE.

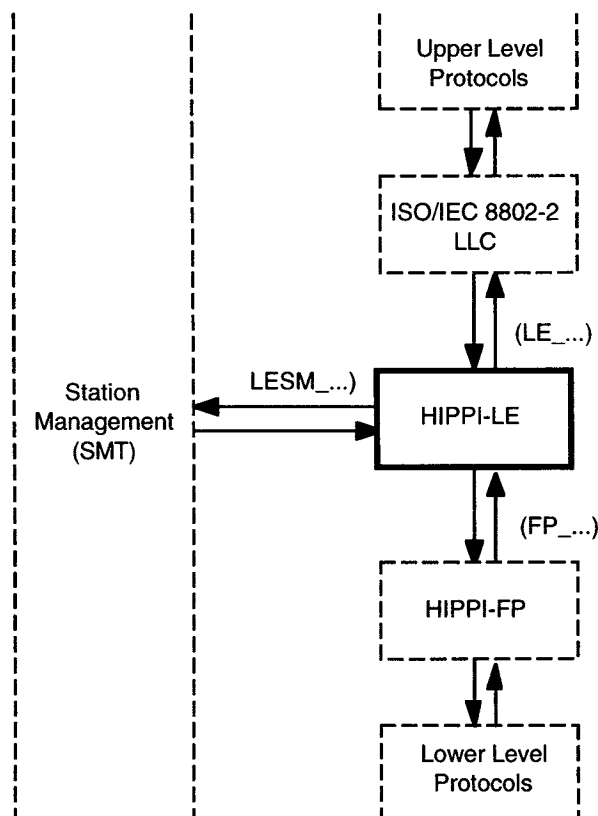


Figure 2 – HIPPI-LE service relationship

4.1 Service primitives types

HIPPI service primitives are of four types:

- *Request primitives* are issued by a service user to initiate a service from the service provider;
- *Confirm primitives* are issued by the service provider to acknowledge a Request;
- *Indicate primitives* are issued by the service provider to notify the service user of a local event. This primitive is similar in nature to an unsolicited interrupt. Note that the local event may have been caused by a service Request;
- *Response primitives* are issued by a service user to acknowledge an Indicate.

4.2 Sequences of primitives

The order of execution of service primitives is not arbitrary. Logical and time sequence relationships exist for all described service primitives. Time sequence diagrams are used to illustrate a valid sequence. Other valid sequences may exist. The sequence of events between peer users across the user/provider interface is illustrated. In the time sequence diagrams, the HIPPI-LE users are depicted on either side of the vertical bars while the service provider is in the centre.

4.3 HIPPI-LE service primitive summary

ISO/IEC 8802-2 LLC Data Transfer:

LE_TRANSFER.Request (
Destination_Address,
LE_SDU)

LE_TRANSFER.Confirm (Transmission_Status)

LE_TRANSFER.Indicate (
Destination_Address,
Source_Address,
LE_SDU,
Reception_Status)

LE_TRANSFER.Response

Address Resolution Protocol:

LE_ADDRESS_RESOLUTION.Request (
Destination_Address,
Destination_ULA,
Destination_Switch_Address,
Source_ULA,
Source_Switch_Address,
Message_Type,
LE_SDU)

LE_ADDRESS_RESOLUTION.Confirm
(Transmission_Status)

LE_ADDRESS_RESOLUTION.Indicate (
 Destination_ULA,
 Destination_Switch_Address,
 Source_ULA,
 Source_Switch_Address,
 Message_Type,
 LE_SDU,
 Reception_Status)

LE_ADDRESS_RESOLUTION.Response

Local Station Management:

LESM_STATUS_CTRL.Request (Control)

LESM_STATUS_CTRL.Confirm (Status)

LESM_STATUS_CTRL.Indicate (Status)

LESM_STATUS_CTRL.Response

4.4 HIPPI-LE transfer service primitives

These primitives, as illustrated in figure 3, are used to transfer an ISO/IEC 8802-2 LLC PDU from source ISO/IEC 8802-2 LLC to destination ISO/IEC 8802-2 LLC.

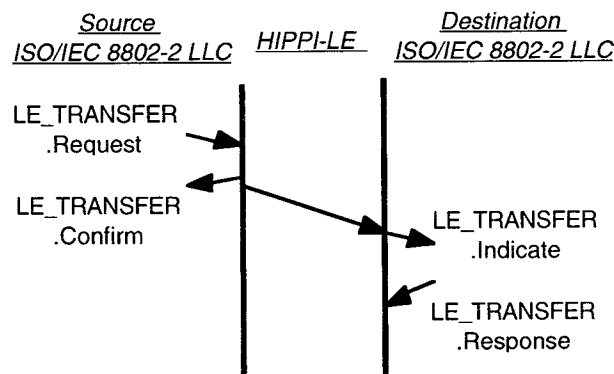


Figure 3 – Data transfer service primitives

4.4.1 LE_TRANSFER.Request

This primitive is issued by the source ISO/IEC 8802-2 LLC to request a data transfer to the destination ISO/IEC 8802-2 LLC. The HIPPI-LE PDU format is defined in 6.1.

LE_TRANSFER.Request (
 Destination_Address,
 LE_SDU)

Destination_Address is the information necessary to forward the HIPPI-LE PDU to its desired destination.

LE_SDU is the service data unit which includes the ISO/IEC 8802-2 LLC PDU that is to be sent.

NOTE – The Requested_Service_Class parameter of ISO/IEC 8802-2 LLC is not used by HIPPI-LE.

Issued – The source ISO/IEC 8802-2 LLC issues this primitive to request a transfer of an ISO/IEC 8802-2 LLC PDU to a destination ISO/IEC 8802-2 LLC.

Effect – The Source HIPPI-LE shall accept the ISO/IEC 8802-2 LLC PDU for transmission. The HIPPI-LE shall build an LE_Header and D2_Area, as specified in 6.1, and invoke FP_TRANSFER.Request to send the HIPPI-LE PDU to the destination.

NOTE – Significant performance loss may occur if the D2_Offset in the HIPPI-FP header is non zero, although receivers must be prepared to accept any D2_Offset allowed by HIPPI-FP.

4.4.2 LE_TRANSFER.Confirm

This primitive acknowledges the LE_TRANSFER.Request from the Source ULP.

LE_TRANSFER.Confirm (Transmission_Status)

Transmission_Status is used to pass status information back to the local requesting LLC entity. The content of the Transmission_Status is implementation dependent.

NOTE – The Provided_Service_Class parameter of ISO/IEC 8802-2 LLC is not used by HIPPI-LE.

Issued – The HIPPI-LE issues this primitive to the Source ISO/IEC 8802-2 LLC to acknowledge the LE_TRANSFER.Request.

Effect – Unspecified.

4.4.3 LE_TRANSFER.Indicate

This primitive indicates to the ISO/IEC 8802-2 LLC that a HIPPI-LE PDU addressed to the HIPPI-LE entity at this particular destination has been received.

LE_TRANSFER.Indicate (
 Destination_Address,
 Source_Address,
 LE_SDU,
 Reception_Status)

Destination_Address includes the ISO/IEC 8802-2 48-bit address as contained in the Destination_IEEE_Address field of the received HIPPI-LE PDU.

Source_Address includes the ISO/IEC 8802-2 48-bit address as contained in the Source_IEEE_Address field of the received HIPPI-LE PDU.

LE_SDU is the service data unit that includes the encapsulated ISO/IEC 8802-2 LLC PDU as contained in the D2_Data_Set of the received HIPPI-LE PDU.

Reception_Status shall denote whether the received HIPPI-LE PDU was received with errors. Reception_Status may include other information.

NOTE – The Requested_Service_Class parameter of ISO/IEC 8802-2 LLC is not used by HIPPI-LE.

Issued – The destination HIPPI-LE issues this primitive to the destination ISO/IEC 8802-2 LLC when a PDU for the ISO/IEC 8802-2 LLC has been received.

Effect – Unspecified.

NOTE – This part of ISO/IEC 11518 does not protect against errors that may be introduced by intermediate devices that interconnect HIPPI-PHs, e.g., re-ordered HIPPI bursts.

4.4.4 LE_TRANSFER.Response

This primitive acknowledges the LE_TRANSFER.Indicate from the Destination HIPPI-LE.

LE_TRANSFER.Response

Issued – The destination ISO/IEC 8802-2 LLC issues this primitive to acknowledge receipt of the LE_TRANSFER.Indicate.

Effect – Unspecified.

4.5 HIPPI-LE address resolution primitives

These primitives, as illustrated in figure 4, are used for dynamic discovery of a remote destination's hardware (switch) address. Two HIPPI-LE message types, AR_Request and AR_Response, accomplish the task of discovering a remote destination's switch address given its Universal LAN MAC Address (ULA). Support of these primitives is an implementation option. See clause 7 for a discussion of HIPPI address resolution.

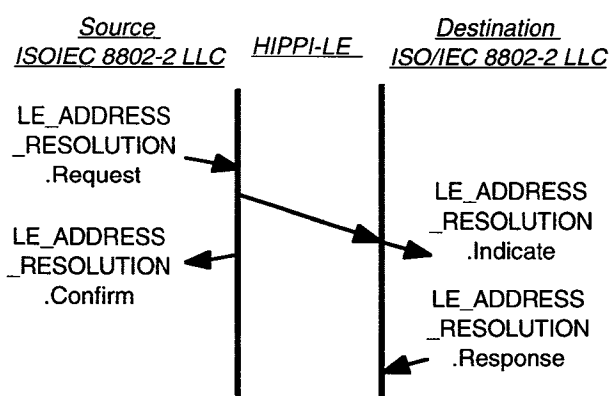


Figure 4 - HIPPI-LE Address resolution service primitives

4.5.1 LE_ADDRESS_RESOLUTION.Request

This primitive is issued by the source ISO/IEC 8802-2 LLC to request an address resolution PDU (with optional data) to be sent. The HIPPI-LE PDU format is defined in 6.1.

LE_ADDRESS_RESOLUTION.Request(
Destination_Address,
Destination_ULA,
Destination_Switch_Address,
Source_ULA,
Source_Switch_Address,
Message_Type,
LE_SDU)

Destination_Address is the information necessary to forward the HIPPI-LE PDU to the desired destination. The HIPPI-LE layer forms the Connection Control Information (CCI) for the HIPPI-FP layer from this.

Destination_ULA supplies the information to form the Destination_IEEE_Address field in the outgoing HIPPI-LE PDU.

Destination_Switch_Address supplies the information to form the Destination_Switch_Address field in the outgoing HIPPI-LE PDU.

Source_ULA supplies the information to form the Source_IEEE_Address field in the outgoing HIPPI-LE PDU.

Source_Switch_Address supplies the information to form the Source_Switch_Address field in the outgoing HIPPI-LE PDU.

Message_Type specifies information for the Message_Type field of the header. (see 6.1.1)

LE_SDU is the optional ISO/IEC 8802-2 LLC PDU to be sent.

Issued - The source ISO/IEC 8802-2 LLC issues this primitive to request the transfer of a HIPPI-LE Address Resolution Request or Response PDU, with or without an ISO/IEC 8802-2 LLC PDU, to a destination ISO/IEC 8802-2 LLC.

Effect - The Source HIPPI-LE shall accept the ISO/IEC 8802-2 LLC PDU for transmission. The HIPPI-LE shall build an LE_Header and optional D2_Area as specified in 6.1, and invoke an FP_TRANSFER.Request to send the HIPPI-LE PDU to the destination.

4.5.2 LE_ADDRESS_RESOLUTION.Confirm

This primitive acknowledges the LE_ADDRESS_RESOLUTION.Request from the Source ULP.

LE_ADDRESS_RESOLUTION.Confirm (Transmission_Status)

Transmission_Status is used to pass status information back to the local requesting LLC entity. The content of the Transmission_Status is implementation dependent.