INTERNATIONAL STANDARD

ISO 8327

First edition
1987-08-15

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION
МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Information processing systems — Open Systems Interconnection — Basic connection oriented session protocol specification

Systèmes de traitement de l'information — Interconnexion de systèmes ouverts — Protocole de session en mode connexion

Reference number
ISO 8327 : 1987 (E)

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 8327 was prepared by Technical Committee ISO/TC 97, *Information processing systems*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Printed in Switzerland

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Information processing systems — Open Systems Interconnection — Basic connection oriented session protocol specification

0 Introduction

This International Standard is one of a set of International Standards produced to facilitate the interconnection of computer systems. The set of International Standards covers the services and protocols required to achieve such interconnection.

This International Standard is related to other International Standards in the set as defined by the Reference Model for Open Systems Interconnection (ISO 7498). The Reference Model subdivides the area of standardization for interconnection into a series of layers of specification, each of manageable size. It is most closely related to and lies within the field of application of the Session Service Definition (ISO 8326). It also uses and references the Transport Service Definition (ISO 8072), whose provisions it assumes in order to accomplish the aims of the session protocol. The interrelationship of these International Standards is illustrated in figure 1.

This International Standard specifies a single protocol with a common encoding.

It is intended that the session protocol should be general enough to cater for the total range of session service users without restricting future extensions.

The protocol is structured so that subsets of protocol can be defined.

The primary aim of this International Standard is to provide a set of rules for communication expressed in terms of the procedures to be carried out by peer session entities at the time of communication. These rules for communication are intended to provide a sound basis for development in order to serve a variety of purposes :

a) as a guide for implementors and designers;

b) for use in the testing and procurement of equipment;

c) as part of an agreement for the admittance of systems into the open systems environment;

d) as a refinement to the understanding of OSI.

As it is expected that the initial users of this International Standard will be designers and implementors of equipment this International Standard contains, in notes or in annexes, guidance on the implementation of the procedures defined herein.

It should be noted that, as the number of valid protocol sequences is very large, it is not possible with current technology to verify that an implementation will operate the protocol defined in this International Standard correctly under all circumstances. It is possible by means of testing to establish confidence that an implementation correctly operates the protocol in a representative sample of circumstances. It is, however, intended that this International Standard can be used in circumstances where two implementations fail to communicate in order to determine whether one or both have failed to operate the protocol correctly.

The variations and options available within this International Standard are essential as they enable a session service to be provided for a wide variety of applications. Thus, a minimally conforming implementation will not be suitable for use in all possible circumstances. It is important, therefore, to qualify all references to this International Standard with statements of the options provided or required or with statements of the intended purpose of provision or use.

This International Standard contains the following annexes :

a) annex A — State tables;

b) annex B — Relationship to CCITT Recommendation T.62 encoding;

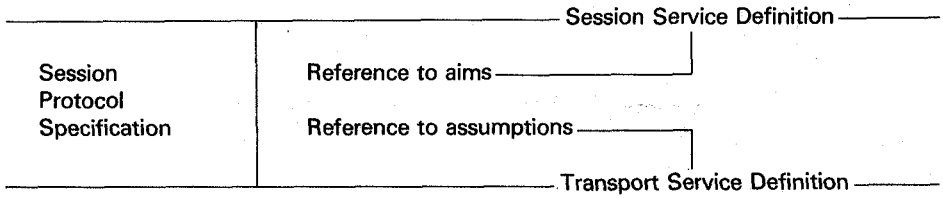

Figure 1 — Relationship between the session protocol and adjacent services

c) annex C — PGIs and PIs reserved for use by Recommendation T.62.

1 Scope and field of application

This International Standard specifies

a) procedures for a single protocol for the transfer of data and control information from one session entity to a peer session entity;

b) the means of selecting the functional units to be used by the session entities;

c) the structure and encoding of the session protocol data units used for the transfer of data and control information.

The procedures are defined in terms of

a) the interactions between peer session entities through the exchange of session protocol data units;

b) the interactions between a session entity and the session service user in the same system through the exchange of session service primitives;

c) the interactions between a session entity and the transport service provider through the exchange of transport service primitives.

These procedures are applicable to instances of communication between systems which support the Session Layer of the OSI Reference Model and which wish to interconnect in an open systems environment.

This International Standard also specifies conformance requirements for systems implementing these procedures. It does not contain tests which can be used to demonstrate this conformance.

2 References

ISO 7498, *Information processing systems — Open Systems Interconnection — Basic Reference Model.*

ISO 7498/Add. 3, *Information processing systems — Open Systems Interconnection — Basic Reference Model — Addendum 3: Naming including addressing.*[1)]

ISO 8072, *Information processing systems — Open Systems Interconnection — Transport Service Definition.*

ISO 8326, *Information processing systems — Open Systems Interconnection — Basic connection oriented session service definition.*

CCITT Recommendation T.62, *Control Procedures for the Teletex and Group 4 Facsimile Services.*

NOTE — CCITT Recommendation T.62 is not essential for the application of this International Standard, but is included in the list of references as it has been referred to, for information, in relation to interworking with the CCITT Telematic services (see annex B and C).

1) At present at the stage of draft; publication anticipated in due course.

Section one : General

3 Definitions

NOTE — The definitions contained in this clause make use of abbreviations defined in clause 4.

3.1 This International Standard is based on the concepts developed in ISO 7498, and makes use of the following terms defined in it :

a) expedited-session-service-data-unit;

b) session-connection;

c) Session Layer;

d) session-protocol-data-unit;

e) session-service;

f) session-service-access-point;

g) session-service-data-unit;

h) Transport Layer;

i) transport-connection;

j) transport-service;

k) transport-service-access-point;

l) concatenation;

m) segmenting;

n) session selector (defined in ISO 7498/Add. 3).

3.2 This International Standard is also based on concepts developed in ISO 8326 and makes use of the following terms defined in it :

a) token;

b) calling SS-user;

c) called SS-user;

d) sending SS-user;

e) receiving SS-user;

f) requesting SS-user;

g) accepting SS-user;

h) requestor;

i) acceptor.

NOTE — The following terms used in this International Standard are used in relation to tokens and are explained in ISO 8326 :

a) assigned;

b) not assigned;

c) available;

d) not available.

3.3 For the purposes of this International Standard, the following definitions also apply.

3.3.1 Session Protocol Machine (SPM) : An abstract machine that carries out the procedures specified in this protocol.

NOTE — A session entity comprises one or more SPMs.

3.3.2 session-service user (SS-user) : An abstract representation of the totality of those entities within a single system that make use of the session service.

3.3.3 transport-service provider (TS-provider) : An abstract machine which models the totality of the entities providing the transport service, as viewed by a session entity.

3.3.4 local matter : A decision made by a system concerning its behaviour in the Session Layer that is not subject to the requirements of this protocol.

3.3.5 initiator : An SPM that initiates a CONNECT SPU.

3.3.6 responder : An SPM with whom an initiator wishes to establish a session connection.

NOTE — Initiator and responder are defined with respect to a single session connection.

3.3.7 sending SPM : An SPM that sends a given SPDU.

3.3.8 receiving SPM : An SPM that receives a given SPDU.

3.3.9 owner (of a token) : The SPM to whom a token is assigned.

3.3.10 proposed parameter : The value for a parameter proposed by an SPM in a CONNECT SPDU or an ACCEPT SPDU that it wishes to use on the session connection.

3.3.11 negotiation : The process by which two SPMs agree on a common set of functional units and protocol values and on the initial setting of available tokens.

3.3.12 selected parameter : The value for a parameter that has been chosen for use on the session connection.

3.3.13 valid SPDU : An SPDU which complies with the requirements of this International Standard with respect to structure and encoding.

3.3.14 invalid SPDU : An SPDU which does not comply with the requirements of this International Standard with respect to structure and encoding.

3.3.15 protocol error : Use of an SPDU that does not comply with the procedures agreed for the session connection.

3.3.16 transparent (data) : SS-user data which is transferred intact between SPMs and which is unavailable for use by the SPMs.

3.3.17 SPDU identifier (SI) : Heading information that identifies the SPDU concerned.

3.3.18 length indicator (LI) : An indicator that represents the length of an associated parameter field.

3.3.19 parameter field : A group of one or more octets used to represent a particular set of information.

3.3.20 parameter identifier (PI) : An identifier, defined in this International Standard, that indicates the type of information contained in its associated parameter field.

3.3.21 PI unit : An element of an SPDU that contains a PI field together with its associated LI field and parameter field.

3.3.22 parameter group identifier (PGI) : An identifier, defined in this International Standard, that indicates the type of information contained in its associated parameter field. The associated parameter field may consist of a set of PI units.

3.3.23 PGI unit : An element of an SPDU that contains a PGI field together with its associated LI field and parameter field.

3.3.24 parameter value (PV) : Information that represents the value of the parameter identified by either a PI or PGI.

3.3.25 local variable : A local variable within the SPM which is used as a means of clarifying the effects of certain actions and clarifying the conditions under which certain actions are permitted.

4 Symbols and abbreviations

4.1 Data units

SPDU session-protocol-data-unit
SSDU session-service-data-unit
TSDU transport-service-data-unit

4.2 SPDU fields

SI SPDU identifier (see 3.3.17)
LI length indicator (see 3.3.18)
PI parameter identifier (see 3.3.20)
PGI parameter group identifier (see 3.3.22)
PV parameter value (see 3.3.24)

4.3 Timer variables

TIM Disconnection and abort timer

4.4 Miscellaneous

SPM Session Protocol Machine (see 3.3.1)
SS session-service
SSAP session-service-access-point
TSAP transport-service-access-point

4.5 Local variables

Vact See 5.8.1
Vnextact See 5.8.2
V(A) See 5.8.3
V(M) See 5.8.4
V(R) See 5.8.5
Vsc See 5.8.6

5 Overview of the session protocol

5.1 Model of the Session Layer

The SPM (see the note) within the Session Layer communicates with the SS-user through an SSAP by means of the service primitives as defined by the session service definition (ISO 8326). Service primitives will cause or be the result of session protocol data unit exchanges between the peer SPMs using a transport connection. These protocol exchanges are effected using the services of the Transport Layer as defined by the transport service definition (ISO 8072) through two TSAPs.

Session connection endpoints are identified in end systems by an internal, implementation dependent, mechanism so that the SS-user and the SPM can refer to each session connection.

The model of the Session Layer is illustrated in figure 2.

NOTE — A session entity comprises one or more SPMs.

5.2 Services provided by the Session Layer

The protocol specified in this International Standard supports the session service defined in ISO 8326. Information is transferred to and from the SS-user using the session service primitives listed in table 1. Table 1 also defines the SPDUs associated with each of the service primitives.

5.3 Services assumed from the Transport Layer

The protocol specified in this International Standard assumes the use of the connection-oriented transport service defined in ISO 8072.

Information is transferred to and from the TS-provider in the transport service primitives listed in table 2.

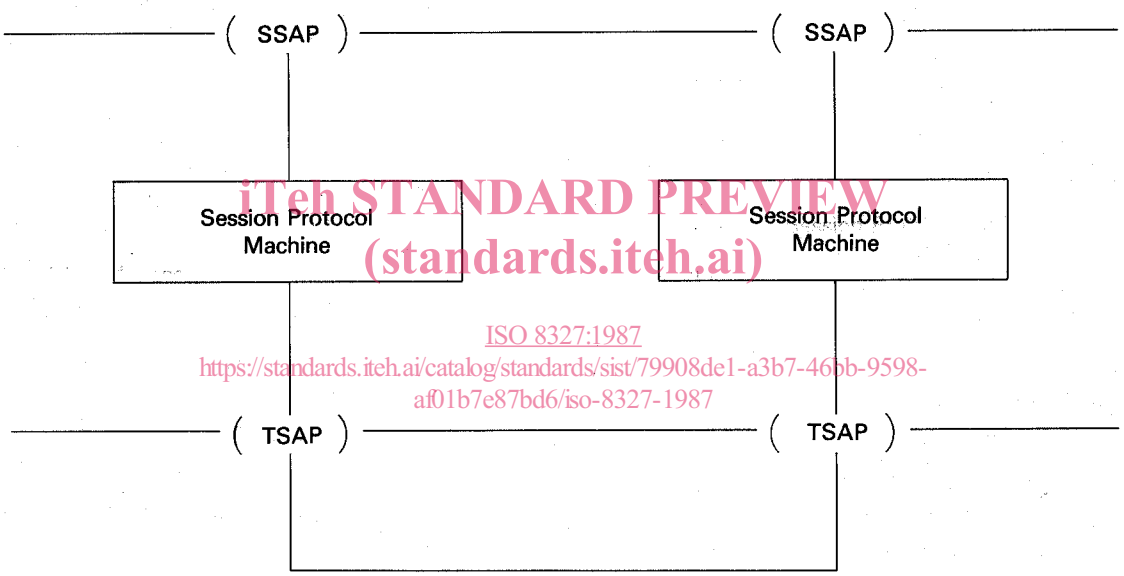

Figure 2 — Model of the Session Layer

Table 1 — Session service primitives

Service	Primitives	Associated SPDUs
Session connection	S-CONNECT request	CONNECT SPDU
	S-CONNECT indication	CONNECT SPDU
	S-CONNECT (accept) response	ACCEPT SPDU
	S-CONNECT (accept) confirm	ACCEPT SPDU
	S-CONNECT (reject) response	REFUSE SPDU
	S-CONNECT (reject) confirm	REFUSE SPDU
Normal data transfer	S-DATA request	DATA TRANSFER SPDU
	S-DATA indication	DATA TRANSFER SPDU
Expedited data transfer	S-EXPEDITED-DATA request	EXPEDITED DATA SPDU
	S-EXPEDITED-DATA indication	EXPEDITED DATA SPDU
Typed data transfer	S-TYPED-DATA request	TYPED DATA SPDU
	S-TYPED-DATA indication	TYPED DATA SPDU
Capability data exchange	S-CAPABILITY-DATA request	CAPABILITY DATA SPDU
	S-CAPABILITY-DATA indication	CAPABILITY DATA SPDU
	S-CAPABILITY-DATA response	CAPABILITY DATA ACK SPDU
	S-CAPABILITY-DATA confirm	CAPABILITY DATA ACK SPDU
Give tokens	S-TOKEN-GIVE request	GIVE TOKENS SPDU
	S-TOKEN-GIVE indication	GIVE TOKENS SPDU
Please tokens	S-TOKEN-PLEASE request	PLEASE TOKENS SPDU
	S-TOKEN-PLEASE indication	PLEASE TOKENS SPDU
Give control	S-CONTROL-GIVE request	GIVE TOKENS CONFIRM SPDU
	S-CONTROL-GIVE indication	GIVE TOKENS CONFIRM SPDU
Minor synchron-ization point	S-SYNC-MINOR request	MINOR SYNC POINT SPDU
	S-SYNC-MINOR indication	MINOR SYNC POINT SPDU
	S-SYNC-MINOR response	MINOR SYNC ACK SPDU
	S-SYNC-MINOR confirm	MINOR SYNC ACK SPDU
Major synchron-nization point	S-SYNC-MAJOR request	MAJOR SYNC SPDU
	S-SYNC-MAJOR indication	MAJOR SYNC POINT SPDU
	S-SYNC-MAJOR response	MAJOR SYNC ACK SPDU
	S-SYNC-MAJOR confirm	MAJOR SYNC ACK SPDU
Resynchron-ization	S-RESYNCHRONIZE request	RESYNCHRONIZE SPDU
	S-RESYNCHRONIZE indication	RESYNCHRONIZE SPDU
	S-RESYNCHRONIZE response	RESYNCHRONIZE ACK SPDU
	S-RESYNCHRONIZE confirm	RESYNCHRONIZE ACK SPDU
P-Exception report	S-P-EXCEPTION-REPORT indication	EXCEPTION REPORT SPDU
U-Exception reporting	S-U-EXCEPTION-REPORT request	EXCEPTION DATA SPDU
	S-U-EXCEPTION-REPORT indication	EXCEPTION DATA SPDU
Activity start	S-ACTIVITY-START request	ACTIVITY START SPDU
	S-ACTIVITY-START indication	ACTIVITY START SPDU

Table 1 (*concluded*)

Service	Primitives	Associated SPDUs
Activity resume	S-ACTIVITY-RESUME request	ACTIVITY RESUME SPDU
	S-ACTIVITY-RESUME indication	ACTIVITY RESUME SPDU
Activity interrupt	S-ACTIVITY-INTERRUPT request	ACTIVITY INTERRUPT SPDU
	S-ACTIVITY-INTERRUPT indication	ACTIVITY INTERRUPT SPDU
	S-ACTIVITY-INTERRUPT response	ACTIVITY INTERRUPT ACK SPDU
	S-ACTIVITY-INTERRUPT confirm	ACTIVITY INTERRUPT ACK SPDU
Activity discard	S-ACTIVITY-DISCARD request	ACTIVITY DISCARD SPDU
	S-ACTIVITY-DISCARD indication	ACTIVITY DISCARD SPDU
	S-ACTIVITY-DISCARD response	ACTIVITY DISCARD ACK SPDU
	S-ACTIVITY-DISCARD confirm	ACTIVITY DISCARD ACK SPDU
Activity end	S-ACTIVITY-END request	ACTIVITY END SPDU
	S-ACTIVITY-END indication	ACTIVITY END SPDU
	S-ACTIVITY-END response	ACTIVITY END ACK SPDU
	S-ACTIVITY-END confirm	ACTIVITY END ACK SPDU
Orderly release	S-RELEASE request	FINISH SPDU
	S-RELEASE indication	FINISH SPDU
	S-RELEASE (accept) response	DISCONNECT SPDU
	S-RELEASE (accept) confirm	DISCONNECT SPDU
	S-RELEASE (reject) response	NOT FINISHED SPDU
	S-RELEASE (reject) confirm	NOT FINISHED SPDU
U-Abort	S-U-ABORT request	ABORT SPDU
	S-U-ABORT indication	ABORT SPDU
P-Abort	S-P-ABORT indication	ABORT SPDU

Table 2 — Transport service primitives

Primitives	X/Y	Parameters
T-CONNECT request indication	X	Called address Calling address Expedited data option Quality of service TS-user-data
T-CONNECT response confirm	X	Quality of service Responding address Expedited data option TS-user-data
T-DATA request indication	X	TS-user-data
T-EXPEDITED-DATA request indication	Y	TS-user-data
T-DISCONNECT request	X	TS-user-data
T-DISCONNECT indication	X	Disconnect reason TS-user-data

Key :

X : The session protocol assumes that this service is always available.

Y : The session protocol assumes that this service is provided by the Transport Layer when requested by the SPM during the session connection establishment phase.

5.4 Functions of the Session Layer

5.4.1 Overview of functions

The functions in the Session Layer are those necessary to bridge the gap between the services available from the Transport Layer and those offered to the SS-users.

The functions in the Session Layer are concerned with dialogue management, data flow synchronization, and data flow resynchronization.

These functions are described below; the descriptions are grouped into those concerned with the connection establishment phase, the data transfer phase, and the release phase.

5.4.2 Connection establishment phase

The purpose of the connection establishment phase is to establish a session connection between two SS-users, and

a) to map session addresses onto transport addresses;

b) to select transport quality of service parameters needed (see 6.1.4);

c) to negotiate session parameters (see 7.1 and 7.2);

d) to transfer session selectors (see 7.1 and 7.2) if required;

e) to distinguish between session connections (see 7.1 and 7.2);

f) to transfer a limited amount of transparent user data (see 7.1 and 7.2).

5.4.3 Data transfer phase

The purpose of the data transfer phase is to transport SSDUs between two SS-users connected by a session connection. This purpose is achieved by means of transmission of SPDUs and by the following functions, each of which may or may not be used, depending on the functional units selected in the session connection establishment phase. These concepts are defined in ISO 8326 :

a) normal data transfer (see 7.9), which may involve segmenting of SSDUs into SPDUs and reassembly by the destination SPM; and concatenation and separation of certain SPDUs. There are two modes of operation :

1) half-duplex, when the right to send data is restricted to the owner of the data token;

2) duplex, when there is no restriction on the right to send data.

b) token management (see 7.14 to 7.17), to enable the SS-users to request and transfer tokens which control the exclusive right to exercise certain functions (see table 5);

c) exception reporting (see 7.25 and 7.26), to enable the SS-provider or the SS-user to report exception conditions that are less than those requiring abort;

d) typed data transfer (see 7.11), to enable transfer of information which is not subject to assignment of the data token;

e) minor synchronization point (see 7.18 and 7.19), to enable the SS-users to define minor synchronization points in the normal data flow. These minor synchronization points may optionally be confirmed, but have no implications on the data flow. Minor synchronization points are identified by synchronization point serial numbers. The serial number is incremented by one on each occasion that a minor synchronization point is placed in the data flow, and each time a minor synchronization point is received, such that both SS-users have the same serial numbers for the same synchronization point;

f) major synchronization point [see 7.20 and 7.21 and e) above], to enable the SS-users to define major synchronization points in the normal data flow. These major synchronization points are required to be confirmed before the requesting SS-user is permitted to send any subsequent data on either the normal flow or the expedited flow and as such clearly separate the dialogue units;

g) resynchronize (see 7.22 and 7.23), a function that allows a session connection to be set or reset to a defined synchronization point and reassign the tokens;

h) expedited data transfer (see 7.10), a function used to convey a limited amount of user data with special handling. Such data may bypass normal data en route, but will be delivered prior to any data subsequently sent on the transport normal flow or the transport expedited flow;

i) activity management (see 7.27 to 7.34) provides a means explicitly to start, end, assume, interrupt or discard an activity. This provides a way

1) to identify the entered activity and commence synchronization point serial numbering;

2) to identify the continued activity and reset the synchronization point serial number in case of resumption;

j) capability data exchange (see 7.12 and 7.13), to provide a confirmed transfer of a limited amount of user data.

5.4.4 Connection release phase

The purpose of the release phase is to provide disconnection of the session connection, by using the following functions :

a) orderly release (negotiated and non-negotiated);

b) abort (provider and user initiated);

c) transfer of a limited amount of transparent user data.

5.5 Functional units

Functional units are logical groupings of related elements of procedure defined by this International Standard for the purpose of

a) negotiation for use during session connection establishment;

b) specification of conformance requirements.

The SPDUs associated with elements of procedure for each functional unit are specified in table 3.

Tokens are associated with functional units (see 5.6).

5.5.1 Kernel functional unit

The kernel functional unit supports the basic protocol elements of procedure required to establish a session connection, transfer normal data and release the session connection.

5.5.2 Negotiated release functional unit

The negotiated release functional unit supports the negotiated release service which enables the SS-users to negotiate the orderly release of the session connection. If this functional unit has been selected, an attempt to release the session connection may be refused by the accepting SS-user.

5.5.3 Half-duplex functional unit

The half-duplex functional unit is used to control the right to send data. It is not valid to select both this functional unit and the duplex functional unit for use on the same session connection.

5.5.4 Duplex functional unit

The duplex functional unit is used when the right to send data is not controlled. It is not valid to select both this functional unit and the half-duplex functional unit for use on the same session connection.

5.5.5 Expedited data functional unit

The expedited data functional unit supports the expedited data service and allows the transfer of a limited amount of SS-user data.

The services supported by this functional unit can only be requested when the transport expedited flow is available to this session connection.

5.5.6 Typed data functional unit

The typed data functional unit enables the SS-users to transfer data in a manner which is not subject to the control imposed by the availability of the data token.

5.5.7 Capability data exchange functional unit

The capability data functional unit supports the capability data exchange service, which allows a confirmed transfer of a limited amount of SS-user data when the activity management functional unit has been selected, but when no activity is in progress.

5.5.8 Minor synchronize functional unit

The minor synchronize functional unit supports the minor synchronization service which enables the SS-user to request that the SPM places minor synchronization points in the normal data flow. These minor synchronization points are identified by serial numbers.

5.5.9 Major synchronize functional unit

The major synchronize functional unit supports the major synchronize service which enables the SS-user to request that the SPM places major synchronization points in the normal data flow. These major synchronization points are identified by serial numbers, and clearly separate the data flow before and after the major synchronization point.

5.5.10 Resynchronize functional unit

The resynchronize functional unit supports the resynchronize service which enables the SS-users to modify the synchronization point serial number and reassign the tokens.

5.5.11 Exceptions functional unit

The exceptions functional unit allows both the SPM and the SS-users to report detected errors, rather than aborting the session connection.

This functional unit can only be selected when the half-duplex functional unit has been selected.

5.5.12 Activity management functional unit

The activity management functional unit supports the activity management services which allows the SS-users to manage synchronized logical pieces of work.

5.6 Tokens

Table 4 specifies those functional units that have tokens associated with them.

The SPM may only send an SPDU listed in table 5 (and accept the associated service primitive) subject to the availability and assignment of tokens defined in that table.