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**Information technology — Open Systems
Interconnection — Connection-oriented
Session protocol: Protocol specification**

AMENDMENT 1: Efficiency enhancements

*Technologies de l'information — Interconnexion de systèmes ouverts
(OSI) — Protocole de session en mode connexion: Spécification du
protocole*

AMENDEMENT 1: Améliorations d'efficacité



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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.

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INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – OPEN SYSTEMS INTERCONNECTION –
CONNECTION-ORIENTED SESSION PROTOCOL: PROTOCOL SPECIFICATIONAMENDMENT 1
Efficiency enhancements

1) Subclause 2.1

Add the following reference by numerical order:

- ITU-T Recommendation X.215 (1995)/Amd.1 (1997) | ISO/IEC 8326:1996/Amd.1:1997, *Information technology – Open Systems Interconnection – Session service definition – Amendment 1: Efficiency enhancements*.

2) Subclause 2.3

Add the following reference after Recommendation T.62:

- ITU-T Recommendation X.215 (1995)/Addendum 1 (1995), *Service definition for Session Layer efficiency enhancement*.

3) Subclause 3.4

Add the following definitions:

3.4.a long-form SPDU: An SPDU that has the long-form structure defined in 8.2.

3.4.b null-encoding protocol option: An option of the session protocol, negotiated during connection establishment, that permits a data transfer phase with zero session protocol control information and without the ability to signal the orderly release of the session-connection.

3.4.c parameter indication: A field in the low-order bits of the first octet of a short-form SPDU (the high-order bits will contain the SPDU identifier).

3.4.d short-connect protocol option: An option of the session protocol that permits an efficient negotiation, during connection establishment, of the fast associate mechanism (of which the null-encoding protocol defined in ITU-T Rec. X.225 *bis* is a special case) by defining more compact encodings for the connection establishment SPDUs than those defined in ITU-T Rec. X.225 | ISO/IEC 8327-1.

3.4.e short-encoding protocol option: An option of the session protocol that permits the use of smaller protocol control information of some of the more commonly occurring Session SPDUs in the data transfer and release phases.

3.4.f short-form SPDU: An SPDU that has the short-form structure defined in 8.5. All short-form SPDUs have names that begin with the word SHORT and abbreviations beginning with the letter S.

4) Subclause 4.2

Add at the end of the abbreviations list:

SI&P SPDU Identifier (for short-form SPDUs) and Parameter indication

5) Subclause 5.2

In Table 1, referenced in this subclause, add the following items to the cell identified by Session Connection, Associated SPDUs:

Service	Primitives	Associated SPDUs
Session Connection	S-CONNECT request S-CONNECT indication S-CONNECT (accept) response S-CONNECT (accept) confirm S-CONNECT (reject) response S-CONNECT (reject) confirm	CONNECT SPDU or SHORT CONNECT SPDU CONNECT SPDU or SHORT CONNECT SPDU ACCEPT SPDU, SHORT ACCEPT SPDU or SHORT ACCEPT CONTINUE SPDU ACCEPT SPDU, SHORT ACCEPT SPDU or SHORT ACCEPT CONTINUE SPDU REFUSE SPDU, SHORT REFUSE SPDU or SHORT REFUSE CONTINUE SPDU REFUSE SPDU, SHORT REFUSE SPDU or SHORT REFUSE CONTINUE SPDU
Normal Data Transfer	S-DATA request S-DATA indication	DATA TRANSFER SPDU or SHORT DATA TRANSFER SPDU or NULL SPDU DATA TRANSFER SPDU or SHORT DATA TRANSFER SPDU or NULL SPDU
Orderly Release	S-RELEASE request S-RELEASE indication S-RELEASE(accept) response S-RELEASE(accept)indication S-RELEASE(reject) response S-RELEASE(reject)indication	FINISH SPDU or SHORT FINISH SPDU FINISH SPDU or SHORT FINISH SPDU DISCONNECT SPDU or SHORT DISCONNECT SPDU DISCONNECT SPDU or SHORT DISCONNECT SPDU NOT FINISHED SPDU NOT FINISHED SPDU

6) Subclause 5.4.2

Add at the end of the list and before the Note, the following new items:

- h) to negotiate the null-encoding protocol option (see 5.8.7);
- i) to negotiate the upper layer context specification.

7) Subclause 5.6

Add a new subclause as follows:

5.6.2 bis No orderly release functional unit

This functional unit removes the orderly release function from the kernel functional unit.

8) Subclause 5.6.10

Modify Table 3 referenced in this subclause:

Functional Unit	SPDU code	SPDU name	Reference
Kernel	CN	CONNECT (see Note 1)	7.1
	OA	OVERFLOW ACCEPT (see Note 2)	7.2
	CDO	CONNECT DATA OVERFLOW (see Note 2)	7.3
	AC	ACCEPT (see Note 1)	7.4
	RF	REFUSE (see Note 1)	7.5
	FN	FINISH (see Note 10)	7.6
	DN	DISCONNECT (see Note 10)	7.7
	AB	ABORT (see Note 11)	7.9
	AA	ABORT ACCEPT (see Note 3)	7.10
	DT	DATA TRANSFER (see Note 11)	7.11
	PR	PREPARE (see Note 7)	7.26
	SCN	SHORT CONNECT (see Note 14)	7.38
	SAC	SHORT ACCEPT (see Note 14)	7.39
	SRF	SHORT REFUSE (see Note 14)	7.42
	NL	NULL (see Note 13)	7.49
	SCNC	SHORT CONNECT CONTINUE (see Note 14)	7.40
	SACC	SHORT ACCEPT CONTINUE (see Note 14)	7.41
	SRFC	SHORT REFUSE CONTINUE (see Note 14)	7.43
	SFN	SHORT FINISH (see Note 12)	7.44
	SDN	SHORT DISCONNECT (see Note 12)	7.45
	SDT	SHORT DATA TRANSFER (see Note 12)	7.46
	SAB	SHORT ABORT (see Note 12)	7.47
No orderly release		No additional associated SPDUs	

After Note 9 of this table, add the following Notes:

- 10 Not used if the no orderly release functional unit is selected.
- 11 Not used if the null-encoding protocol option is selected.
- 12 Used only if the short-encoding protocol option is supported.
- 13 Used only if the null-encoding protocol option is supported.
- 14 Used only if the short-connect protocol option is selected.

9) Subclause 5.8

Add the new subclauses (at the end of 5.8.6):

5.8.7 Negotiation of short-encoding

Each SPM indicates whether it wishes to use the short-encoding option on the connection. The protocol option is selected only if both SPMs propose use of the option. If the option is selected, the SHORT DATA TRANSFER, SHORT FINISH, SHORT DISCONNECT and SHORT ABORT SPDUs may be used on the connection.

The use of the other short-form SPDUs (SHORT CONNECT, SHORT ACCEPT, SHORT CONNECT CONTINUE, SHORT REFUSE CONTINUE, SHORT ACCEPT CONTINUE and SHORT REFUSE SPDUs) is not affected by the short-encoding protocol option.

5.8.8 Negotiation using short-connect mechanism and Upper-layer context specification

An initiating SPM receiving an S-CONNECT request that includes a Session-user-summary parameter may use the short-connect mechanism. Conceptually, the SPM creates the CONNECT SPDU that would be used to establish the connection. The SPM then uses an Upper-layer context specification to summarize the parameters of this CONNECT SPDU, including the semantic content of the User-data as represented in the User-summary parameter of the S-CONNECT request.

The Upper-layer context specification is identified in the session protocol by either a global-form identifier (an ASN.1 Object Identifier) or a restricted-form identifier (a 16-bit quantity that is unambiguous within the scope of some community of interconnecting systems).

The Upper-layer context specification may or may not define parameters that reflect values of the parameters of the CONNECT SPDU, or, via the Session-user-summary parameter, values contained within the SS-userdata of the S-CONNECT request. The Upper-layer context specification will define that each parameter is either:

- a) immediate: always sent with the identifier; or
- b) compressible: a compressed form can be sent with the identifier, and the original form sent on a subsequent SPDU if the receiver is unable to reverse the compression.

NOTE 1 – The Upper-layer context specification will define the compression algorithm.

The SPM will send the identifier for the Upper-layer context specification and any immediate or compressed parameters in the Connection summary parameter of a SHORT CONNECT SPDU. This SPDU may be sent on the User-data of a T-CONNECT request or on the normal transport flow, using T-DATA.

The SHORT CONNECT SPDU shall only be sent on the T-CONNECT request if the size limitations of the Transport layer permit. How the SPM is made aware of these limits is a local matter.

One of the following will then occur:

- a) The responding SPM is able to reference the Upper-layer context specification and expand any compressed parameters to their original form, and is thus able to reconstruct the CONNECT SPDU that would have been sent. If acceptable to the SPM, an S-CONNECT indication is issued to the SS-user, with no User-data parameter but with the User Summary parameter representing the semantic content of the User-data that would have been sent.

If the SS-user replies with an S-CONNECT (accept) response, the SPM uses the Upper-layer context specification identified on the SHORT CONNECT SPDU to determine the identification of the Summary-response. Again this may have immediate and compressed parameters. The identification and any immediate or compressed parameters are sent in the Summary-response parameter of a SHORT ACCEPT SPDU, which also indicates that connection establishment is complete.

The receipt of the SHORT ACCEPT SPDU at the initiator completes the connection establishment.

NOTE 2 – It is expected that the Upper-layer context identifier together with the short connect PCI will be designed to fit within the size limitation of the T-CONNECT User-data.

- b) The responding SPM is able to reference the Upper-layer context specification but there are compressed parameters that the SPM cannot expand to their original form. The SPM asks for the uncompressed forms to be sent, by sending a SHORT ACCEPT SPDU indicating an incomplete connection establishment.

The initiating SPM, on receiving the SHORT ACCEPT SPDU, sends a SHORT CONNECT CONTINUE SPDU containing the uncompressed forms of the parameters. The responding SPM can now, if the received SPDUs are acceptable, issue an S-CONNECT indication with the semantic content of the missing User-data represented by the User Summary parameter.

If the SS-user replies with an S-CONNECT (accept) response, the SPM uses the Upper-layer context specification identified on the SHORT CONNECT SPDU to determine the identification of the Summary-response and sends this, with any parameters in their uncompressed form on a SHORT ACCEPT CONTINUE SPDU.

- c) The responding SPM is unable to reference the Upper-layer context specification – the identifier is not recognized – and the SHORT CONNECT SPDU was received on an established connection. The SPM replies with SHORT REFUSE SPDU indicating the connection summary is unknown.

On receiving the SHORT REFUSE SPDU, the initiating SPM switches to using the long-form SPDUs for connection establishment, sending the original CONNECT SPDU including any User-data.

- d) The responding SPM is unable to reference the Upper-layer context specification – the identifier is not recognized – and the SHORT CONNECT SPDU was received on a T-CONNECT indication. The SPM ignores it, and just completes the establishment of the transport connection.

On receiving the T-CONNECT confirm with no SPDU in the User-data, the initiating SPM switches to using the long-form SPDUs for connection establishment, sending the original CONNECT SPDU.

- e) The responding SPM does not support the SHORT CONNECT SPDU and the SHORT CONNECT SPDU was received on an established connection. The SPM will perceive this as a protocol error and release the transport connection.

- f) The responding SPM does not support the SHORT CONNECT SPDU and the SHORT CONNECT SPDU was received on a T-CONNECT indication. The SPM ignores it, and just completes the establishment of the transport connection.

On receiving the T-CONNECT confirm with no SPDU in the User-data, the initiating SPM switches to using the long-form SPDUs for connection establishment, sending the original CONNECT SPDU.

5.8.9 Negotiation of null-encoding protocol option

The use of the null-encoding protocol option is negotiated between the peer SPMs at session-connection establishment. It shall only be offered by the initiating SPM if the initiating Session user has requested, and the initiating SPM supports, the no-orderly-release functional unit. In addition, it can only be offered by the initiating SPM if no session layer addressing information is required to be conveyed

The null-encoding protocol option is selected for use on the session connection by the responding SPM. It shall only select the use of the option if:

- a) the null-encoding protocol option was offered by the initiating SPM;
- b) the responding SPM has selected the kernel, full-duplex and no-orderly-release functional units, and no other functional units.

5.8.10 Negotiation using short-connect protocol option with no upper-layer context identifier

The SPMs may use the short-connect protocol option to establish a session connection using the null-encoding option. The short-connect protocol option, as applied to connection establishment, uses the SHORT CONNECT SPDU, SHORT ACCEPT SPDU, SHORT ACCEPT CONTINUE SPDU and (if unsuccessful) the SHORT REFUSE SPDU and SHORT REFUSE CONTINUE SPDU.

The short-connect protocol option can only be used by the initiating SPM if, on the S-CONNECT request primitive:

- a) the Session Connection Identifier parameter is absent;
- b) in the Calling Session Address and Called Session Address, the session selector is absent; and
- c) the Session Requirements parameter specifies the full duplex and no-orderly-release functional unit and no others.

The responding SPM can only issue a SHORT ACCEPT SPDU if, on the S-CONNECT response primitive:

- a) the Session Connection Identifier parameter is absent;
- b) in the Responding Session Address, the session selector is absent;
- c) the Result is “accepted”; and
- d) the Session Requirements parameter specifies the full duplex and no-orderly-release functional unit and no others.

The SHORT CONNECT SPDU, SHORT ACCEPT SPDU and SHORT REFUSE SPDUs can be transferred as User-data on the Transport-layer T-CONNECT primitives or as User-data on T-DATA primitives, if the Transport connection is already established. The mapping to the User-data of the T-CONNECT primitives is only possible if the complete SPDUs, including any User-data, meet any size restrictions of the T-CONNECT User-data. Otherwise procedures are applied to send the SPDUs using the T-DATA primitives.

10) Subclause 6.1.4

Add the following phrase to the antepenultimate paragraph of this subclause:

Only the initiator of the transport connection is permitted to issue the CONNECT SPDU or the SHORT CONNECT SPDU.

Replace the last paragraph of 6.1.4 with the following new paragraphs:

The TS-user data parameter in the T-CONNECT request and indication is used for the SHORT CONNECT SPDU. The TS-user data parameter in the T-CONNECT response and confirm is used for the SHORT ACCEPT SPDU and SHORT REFUSE SPDU if they fit, or for the SHORT ACCEPT CONTINUE SPDU and the SHORT REFUSE CONTINUE SPDU otherwise. When a T-CONNECT request is issued, the TS-user data parameter shall either contain a SHORT CONNECT SPDU or shall be empty. When a T-CONNECT response is issued, the TS-user data parameter shall be empty, unless the T-CONNECT indication contained a SHORT CONNECT SPDU, in which case it shall contain a SHORT ACCEPT SPDU, SHORT REFUSE SPDU, SHORT ACCEPT CONTINUE SPDU or SHORT REFUSE CONTINUE SPDU.

If the responding session implementation does not support the short-connect protocol option, it shall ignore the TS-user data parameter on the T-CONNECT indication and confirm.

11) Subclause 6.3.3

Add the following items at the end of the list of SPDUs:

- NULL SPDU (see 7.49);
- SHORT CONNECT (see 7.38);
- SHORT ACCEPT (see 7.39);
- SHORT CONNECT CONTINUE (see 7.40);
- SHORT ACCEPT CONTINUE (see 7.41);
- SHORT REFUSE (see 7.42);
- SHORT REFUSE CONTINUE (see 7.43);
- SHORT FINISH (see 7.44);
- SHORT DISCONNECT (see 7.45);
- SHORT DATA TRANSFER (see 7.46);
- SHORT ABORT (see 7.47).

Consequently, change the period of the last SPDU of the list to semi-colon.

12) Subclause 6.3.5

Change the first sentence as follows:

Segmenting of SSDUs takes place under the following circumstances, provided the null-encoding option has not been selected.

13) Subclause 6.3.7

Add the following to the column of Category 1 SPDUs in Table 6:

NULL SPDU
SHORT CONNECT
SHORT ACCEPT
SHORT CONNECT CONTINUE
SHORT ACCEPT CONTINUE
SHORT REFUSE
SHORT REFUSE CONTINUE
SHORT FINISH
SHORT DISCONNECT
SHORT DATA TRANSFER
SHORT ABORT

14) Subclause 6.4.4

Replace item b) with:

- b) ABORT SPDUs are sent on the normal transport flow unless the null-encoding option is selected, in which case the ABORT SPDUs are not sent.

15) Subclause 6.6.4

Change the title of this subclause as follows:

6.6.4 Description (when null-encoding option is not selected)

Add the following new subclause after 6.6.4:

6.6.5 Description (when null-encoding option is selected)

When the null-encoding option is selected, the session connection is terminated by disconnection of the supporting transport connection.

16) Subclause 7.1

Add at the end of the paragraph:

The CONNECT SPDU is transmitted when the initiating SPM has chosen not to use a SHORT CONNECT SPDU, or after a SHORT CONNECT SPDU was transmitted on a T-CONNECT request and no SPDU was received on the T-CONNECT confirm, or after a SHORT REFUSE SPDU has been received with reason code value indicating “unknown connection summary”.

17) Subclause 7.1.1

Replace item b) 1) with:

- b) A Connect/Accept Item parameter group containing:
 - 1) A Protocol Options parameter which enables the initiator to indicate its ability to receive extended concatenated SPDUs, to use the null encoding option and its ability to receive the following short-form SPDUs – SHORT DATA TRANSFER, SHORT FINISH, SHORT DISCONNECT and SHORT ABORT SPDU.

The initiator is not able to use the null encoding option unless the no-orderly-release functional unit was proposed by the calling SS-user.

18) Subclause 7.1.2

Replace the first two sentences by:

The sending of a CONNECT SPDU results from one of three events:

- a) If the initiating SPM chooses not to use a SHORT CONNECT SPDU, an S-CONNECT request results in the assignment of a transport connection. When the transport connection is established, a CONNECT SPDU is sent on the transport normal flow.
- b) If the initiating SPM chose to use a SHORT CONNECT SPDU, and sent the SHORT CONNECT SPDU on the User-data of the T-CONNECT request, the receipt of a T-CONNECT confirm with no SPDU in the User-data results in a CONNECT SPDU. This is sent on the transport normal flow.
- c) If the initiating SPM chose to use a SHORT CONNECT SPDU (on a new or established transport connection), an incoming SHORT REFUSE SPDU with the reason code value indicating “unknown connection summary” results in a CONNECT SPDU. This is sent on the transport normal flow.

In all cases, if the Data Overflow ... *continue with rest of original paragraph.*

19) Subclause 7.4.1

Replace b) 1) with:

- b) A Connect/Accept Item parameter group containing:
 - 1) A Protocol Options parameter which enables the responder to indicate its ability to receive extended concatenated SPDUs whether the null encoding option is selected for use on this session connection, and its ability to receive the following short-form SPDUs – SHORT DATA TRANSFER, SHORT FINISH, SHORT DISCONNECT and SHORT ABORT SPDU.

The responder shall not select the null encoding option unless:

- the initiator indicates on the CONNECT SPDU that it is able to use the null encoding option; and
- the functional units selected for use on the session connection [see d) below] are precisely:
 - i) kernel functional unit;
 - ii) full-duplex functional unit;
 - iii) no-orderly-release functional unit.

20) Subclause 7.11

Add the following text at the end of the first sentence of this subclause:

Normal data is transferred by the DATA TRANSFER SPDU unless the null encoding option is selected, in which case the NULL SPDU is used (see 7.49). If the short encoding option is selected, the SPM may transfer data using the SHORT DATA TRANSFER SPDU (see 7.46).

21) Subclauses 7.38 through 7.41

Add the following new subclauses, numbered 7.38 through 7.41.3, after 7.37.3:

7.38 SHORT CONNECT SPDU

The SHORT CONNECT SPDU is sent as a protocol option at the choice of the initiating SPM to establish a session connection if the Session-user Requirements parameter in the S-CONNECT request consists, of only the kernel, full-duplex and no orderly release functional units, and there are no calling and called session selectors.

The SHORT CONNECT SPDU is transmitted by the initiator of the transport connection in order to initiate a session connection when the initiating SPM has chosen to use this SPDU. The SPDU can be transmitted on the User-data of a T-CONNECT request primitive or on a previously assigned, established transport connection.

The initiating SPM can choose to use the SHORT CONNECT SPDU if either:

- a) an Upper-Layer Context Identifier specification is available that, with appropriate parameter values for the Upper-Layer Context Identifier, summarizes the CONNECT SPDU that would be sent if the initiating SPM chose not to use the SHORT CONNECT SPDU; or
- b) in the parameters of the S-CONNECT request:
 - i) the Session Requirements parameter requests only the kernel, full-duplex and no-orderly-release function units;
 - ii) the Called Session Address and Calling Session Address have NIL values of the Called and Calling Session Selectors;
 - iii) the Session Connection Identifier is absent.

7.38.1 Content of SHORT CONNECT SPDU

The SHORT CONNECT SPDU contains:

- a) A Nested Connection Identifier parameter assigned to this connection for a nested session connection only.
- b) A Connection-Summary parameter which identifies an Upper-Layer Context Specification that summarizes the values that would be contained in the parameters of a CONNECT SPDU that could be issued as a result of the S-CONNECT request. The semantic content of the User-data of the S-CONNECT request, if any, shall be included in the Connection-Summary via the Session-user-summary parameter of the S-CONNECT request.

If the Upper-Layer Context Specification defines its own parameters, these shall be included in the Connection-Summary parameter.

- c) A Special User-data parameter to transfer two bits of transparent data.
- d) A User-information field to transfer transparent data. The User-information field shall not be present if any of the other parameters are present.