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Draft for Development

Open Systems Interconnection: session symmetric synchronization protocol (ISO/DIS 8327 DAD 1)

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This publication is not to be regarded as a British Standard

It is being issued in the Draft for Development series of publications and is of a provisional nature because the subject matter is in the process of ongoing development within the International Standards Committee (ISO/TC 97/SC 21 Information Retrieval, Transfer and Management for Open Systems Interconnection).

It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

A review of this Draft for Development will be carried out not later than two years after its publication. Notification of the start of the review period, with a request for the submission of comments from users of this Draft for Development will be made in an announcement in the appropriate issue of *BSI News*. Observations which it is felt should receive attention before the official call for comments will be welcomed.

According to the replies received, the responsible BSI Committee will judge whether the Draft for Development can be converted into a British Standard or what other action should be taken.

National foreword

This Draft for Development has been prepared under the direction of the Office and Information Standards Committee. The primary objective of this Draft for Development is to give advance guidance to product and systems designers concerned with the Session Layer of the Basic Reference Model for Open Systems Interconnection (OSI).

The text of the Draft for Development is identical with the Draft Proposal ISO/DIS 8326 DAD 1 (reference ISO/TC 97/SC 21 N 611) issued May 1985 by the International Organization for Standardization (ISO).

For ease of reproduction the ISO text has been reproduced unchanged but, because the tables contained handwritten entries, these have been retyped and, in table 43 specific actions have been re-listed in numerical order, in table 44 predicates have been re-listed in numerical order, and in tables 46 and 47, columns have been reordered to be in state number order.

The UK has actively participated through BSI Technical Committee OIS/121 in the development of the ISO Draft Proposal. The Technical Committee will review any agreed amendment or addenda to the ISO text and will, where appropriate, update the text of this Draft for Development via an amendment or revision. When the ISO draft reaches an appropriate level of agreement and stability, this Draft for Development may then be converted to a British Standard.

This Draft for Development is closely related to DD 126 which defines the service provided by the protocol specified in this Draft for Development.

This Draft for Development has been issued for information. There is, at present, no specific reference to it in any of the current draft Application or Presentation layer standards. The UK has recommended therefore that it does not progress to the Draft International Standard stage until detailed requirements for it have been identified in higher layer standards.

For information, a list of published British Standards and Drafts for Development (together with those scheduled for publication at the time of publication of this Draft for Development) for OSI, data communications and computer graphics is attached as national appendix A. Press releases for new OSI, data communications and computer graphics British Standards publications will be issued to the computing press, and details of all new publications will be recorded in full in *BSI News*.

Terminology and conventions. The text of the Draft Proposal has been approved as suitable for publication as a Draft for Development without deviation. Some terminology and certain conventions are not identical with those used in Drafts for Development; attention is drawn especially to the following.

Wherever the words 'International Standard' appear, referring to this Draft for Development, they should be read as 'Draft for Development'.

Wherever page numbers are quoted, they are ISO page numbers.

Because of the re-setting of the tables, there is not always a one-to-one correspondence between the BS and ISO pages and, as a consequence, the ISO page numbers for the tables have not been quoted in this Draft for Development.

Cross-references

International standards	Corresponding British Standard
ISO 7498:1984	BS 6568:1984 Description of basic reference model for open systems interconnection (Identical)
ISO/DIS 8326	DD 111:1985 Open Systems Interconnection: basic connection-oriented session service definition (ISO/DIS 8326) (Identical)
ISO/DIS 8326 DAD 1	DD 126:1985 Open Systems Interconnection: session symmetric synchronization service (ISO/DIS 8326 DAD 1) (Identical)
ISO/DIS 8327	DD 112:1985 Open Systems Interconnection: basic connection-oriented protocol specification (ISO/DIS 8327) (Identical)

At the time of publication of this Draft for Development the references in the text to ISO 8326 and ISO 8327 are at the Draft International Standard stage and the reference to ISO 8326 DAD 1 is at the Draft Proposal Stage.

0.0 INTRODUCTION

0.1 General

ISO 8327 specifies the session protocol that provides the session service as described in ISO 8326.

This addendum extends the procedures defined in ISO 8327 to provide an optional symmetric synchronization service. The symmetric synchronize service allows the SS-users to independently identify minor synchronization points on their sending data flows. It also allows the SS-users to resynchronize on one or both directions of flow when the resynchronize functional unit is also selected.

The symmetric synchronization service is fully defined in ISO 8326/DAD1. A brief rationale for this service and a summary of the protocol extensions defined in this addendum comprise the remainder of this Introduction.

0.2 Rationale

The synchronization service currently defined in ISO 8326 is two-way alternate (TWA) in nature. That is, a token is used to control which SS-user is permitted to insert synchronization points into its output flow. This service appears to be adequate for those SS-users who have structured their dialogues as TWA or master/slave.

However, it is also necessary to support those SS-users who develop dialogues which are truly two-way simultaneous (TWS) in nature. For example, an SS-user may choose to send a stream of requests (and minor synchronization points) to its peer SS-user. The peer SS-user may need to set minor synchronization points in its sending flow simultaneously. This could result from a need to send multiple responses per request, to send responses in an order different than the requests, or in some cases to send a request or other control information in the opposite direction. In these cases, correlation of the two flows is an association only perceivable at the level of the SS-users.

The SS-users still need synchronization services; however, each SS-user must have the ability to independently insert minor synchronization points into its output flow. Symmetric synchronization services provide this

[ISO page 2]

capability. The correlation of these minor sync points and the semantics associated with the points is an SS-user responsibility.

This extension is of particular interest to TWS or S-TYPED-DATA users, but is also made available in TWA to permit a user to easily operate in any mode.

When symmetric synchronize and resynchronize services are in use, SS-users may choose to resynchronize on only one direction of data flow or on both directions.

0.3 Summary of Protocol Extensions

To provide the symmetric synchronization protocol extensions, this addendum introduces the symmetric synchronize functional unit, which is available for use with all other functional units except minor synchronize. When the symmetric synchronize functional unit is selected, two synchronization point serial number counters are provided: one for sync points on the SS-user's sending flow and the other for sync points on that SS-user's receiving flow. The synchronize-minor token is not available.

If the major synchronize and/or activity functional units are negotiated then the major/activity token is available. Two serial numbers (one for each direction of flow) are used to fully define a major synchronization point (or activity end). The second serial number is defined in the MAJOR SYNC ACK and ACTIVITY END ACK SPDUs. Two serial numbers are sent in the ACTIVITY RESUME SPDU when the symmetric synchronize functional unit has been selected. With symmetric synchronization, two serial numbers also appear in the CONNECT and ACCEPT SPDUs.

If the resynchronize functional unit and the symmetric synchronize functional unit are selected, the SS-user can choose to request resynchronization on only one direction of flow, or on both directions. If only one direction of flow is to be resynchronized, the RESYNCHRONIZE (RS) and RESYNCHRONIZE-ACKNOWLEDGE (RA) SPDUs contain only the resynchronize option (abandon, set, or restart) and the requested serial number for that direction of flow. If both flows are to be resynchronized, the RS and RA SPDUs contain an option and a serial number for each direction of flow.

Following the Introduction, this addendum has a structure which is similar to that of ISO 8327 and shows the modifications (if any) applicable to each Clause.

It must be noted that the ISO 8327 text often refers to "a serial number" or "a synchronization point serial number". When referring to a major synchronization point, activity end, activity resume, or resynchronization, these references must be read as "serial number(s)" instead of "serial number" to include the symmetric synchronize case. For the sake of brevity, such minor editorial changes are not included in this addendum.

[ISO page 4]

1.0 SCOPE AND FIELD OF APPLICATION

The procedures defined in this addendum are an extension of the basic procedures defined in ISO 8327, and therefore do not prevent communication between session entities implementing ISO 8327 and this addendum and those conforming to ISO 8327 without this addendum.

This addendum describes the procedures necessary to provide the symmetric synchronize functional unit. This functional unit is available for use with all other functional units except the minor synchronize functional unit. It provides a synchronization service which allows both SS-users to independently set minor synchronization points in their sending data flows.

With the symmetric synchronize functional unit, correlation of the two flows and any semantics associated with synchronization points are SS-user responsibilities.

2.0 REFERENCES

ISO 7498 Information processing systems - Open Systems Interconnection - Basic Reference Model

ISO 8326 Information processing systems - Open Systems Interconnection - Session Service Definition

ISO 8327 Information processing systems - Open Systems Interconnection - Session Protocol Specification

ISO 8326/DAD covering Symmetric Synchronization for the Session Service

3.0 DEFINITIONS

This addendum has no effect on Clause 3 of ISO 8327.

4.0 SYMBOLS AND ABBREVIATIONS

This addendum has no effect on Clause 4 of ISO 8327.

[ISO page 6]

Documents

This publication is a Draft for Development and is therefore not to be regarded as a British Standard. See page 1.

5.0 OVERVIEW OF THE SESSION PROTOCOL

5.2 Services provided by the session layer

This addendum introduces the symmetric synchronization service. Table 1 defines the service primitives and the SPDUs associated with these services.

TABLE 1 - Session service primitives

Service	Primitives	Associated SPDUs
Symmetric Sync	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
Resynchronize	S-RESYNCHRONIZE request	MINOR SYNC POINT SPDU
	S-RESYNCHRONIZE indication	MINOR SYNC POINT SPDU
	S-RESYNCHRONIZE response	MINOR SYNC ACK SPDU
	S-RESYNCHRONIZE confirm	MINOR SYNC ACK SPDU

5.4 Functions of the session layer

5.4.3 Data transfer phase

A new function is introduced into the data transfer phase by this addendum: the symmetric synchronize function. If the appropriate functional unit is selected in the session connection establishment phase, then the following function is available during the data transfer phase:

Symmetric Synchronization (see 7.18 through 7.23), to enable the SS-users to define synchronization points independently on their sending flows. These synchronization points may optionally be confirmed, but have no implications on the data flow. Two serial numbers are provided: one to identify points on each direction of data flow. The appropriate serial number is incremented each time a synchronization point is sent or received. The ability to define a minor symmetric synchronization point is not token controlled.

5.5 Functional units

This addendum defines a new functional unit, the symmetric synchronize functional unit.

5.5.8 Minor synchronize functional unit

It is not valid to select both this functional unit and the symmetric synchronize functional unit for use on the same session connection.

5.5.13 Symmetric synchronize functional unit

The symmetric synchronize functional unit supports the symmetric synchronize service which enables SS-users to independently define minor synchronization points in their respective sending flows. These sync points are identified by serial numbers; two serial numbers are provided, each representing points in one direction of flow. The synchronize-minor token is not available. It is not valid to select both this functional unit and the minor synchronize functional unit for use on the same session connection.

The SPDUs associated with the symmetric synchronize functional unit are specified in table 3.

TABLE 3 - Functional units

Functional unit	SPDU code	SPDU name	Reference
Symmetric	NIP	MINOR SYNC POINT	7.18
Synchronize	NIA	MINOR SYNC ACK	7.19

5.6 Tokens

Table 5 defines the token restrictions that apply to the MINOR SYNC POINT SPDU when the symmetric synchronization functional unit is selected.

TABLE 5 - Token restrictions

SPDUS	Data token	Sync-minor	Major/activity	Release token
MINOR SYNC POINT SPDU	nr	3	nr	nr

Key:

3 : Token not available
nr : No restriction

5.7 Negotiation**5.7.1 Negotiation of functional units****5.7.3 Negotiation of initial serial number**

When an SPM proposes any of the minor synchronize, major synchronize, symmetric synchronize or resynchronize functional units but does not propose the activity functional unit, it also proposes values for the initial synchronization point serial number(s). Two serial numbers are proposed if the symmetric synchronize functional unit is proposed; otherwise one serial number is proposed.

If any of the minor synchronize, major synchronize, symmetric synchronize or resynchronize functional units are selected for use on the session connection, then the initial serial number(s) are set to the responder's proposed value(s).

5.8 Local variables

The synchronization variables V(A), V(M), and V(R) are each dual number variables (an ordered pair) when the symmetric synchronize functional unit has been selected. The remainder of this clause defines the symmetric synchronize variables.

5.8.3 V(A) = V(As), V(Ar)

V(As) and V(Ar) are used by the SPM to manage synchronization point confirmations.

V(As) is the lowest serial number on the SPM's sending data flow to which a synchronization point confirmation is expected to be received. No confirmation is expected to be received when $V(As) = V(Ms)$.

V(Ar) is the lowest serial number on the SPM's receiving data flow for which a confirmation has not yet been sent. No confirmation will be sent by the SPM when $V(Ar) = V(Mr)$.

5.8.4 V(M) = V(Ms), V(Mr)

V(Ms) and V(Mr) are used by the SPM to maintain the next serial number to be used on the sending and receiving data flows.

V(Ms) is the serial number of the next synchronization point to be sent. V(Mr) is the serial number of the next synchronization point to be received.

5.8.5 V(R) = V(Rs), V(Rr)

V(Rs) and V(Rr) are used by the SPM to maintain the lowest serial numbers to which resynchronization restart is permitted.

V(Rs) is the lowest serial number on the SPM's sending data flow to which resynchronization restart is permitted.

V(Rr) is the lowest serial number on the SPM's receiving data flow to which resynchronization restart is permitted.

5.8.6 Vsc

Vsc is not used if the symmetric synchronize functional unit has been selected.

SECTION TWO - SESSION PROTOCOL SPECIFICATION

6.0 USE OF A TRANSPORT CONNECTION

This addendum makes no change to the way that a transport connection is used by the SPM as defined in ISO 8327.

7.0 ELEMENTS OF PROCEDURE RELATED TO SPDUs

7.1 CONNECT SPDU

7.1.1 Content of CONNECT SPDU

If the symmetric synchronize functional unit is proposed, two parameters are also proposed by the calling SS-user. These parameters identify the initial serial numbers, one for each direction of data flow. These parameters are defined below; they belong to the Connect/Accept parameter group of the CONNECT SPDU. These two serial number parameters are always proposed when the symmetric synchronize functional unit is proposed. A single serial number parameter is proposed when the minor synchronize, major synchronize or resynchronize functional units are proposed without the symmetric synchronize functional unit.

- First Initial Serial Number parameter which indicates the serial number associated with the calling SS-user's sending direction of flow.
- Second Initial Serial Number parameter which indicates the serial number associated with the called SS-user's sending direction of flow.

7.2 ACCEPT SPDU

7.2.1 Content of ACCEPT SPDU

If the symmetric synchronize functional unit is proposed, two parameters are also proposed by the called SS-user. These parameters identify the initial serial numbers, one for each direction of data flow. These

parameters are defined below; they belong to the Connect/Accept parameter group of the ACCEPT SPDU. These two serial number parameters are always proposed when the symmetric synchronize functional unit is proposed. A single serial number parameter is proposed when the minor synchronize, major synchronize or resynchronize functional units are proposed without the symmetric synchronize functional unit.

- a) First Initial Serial Number parameter which indicates the serial number associated with the calling SS-user's sending direction of flow.
- b) Second Initial Serial Number parameter which indicates the serial number associated with the called SS-user's sending direction of flow.

The Session User Requirements parameter contains a list indicating the functional units proposed by the called SS-user and can be supported by the responder. The symmetric synchronize functional unit and the minor synchronize functional unit may both be indicated in the CONNECT SPDU, but the ACCEPT SPDU must propose at most one of the two functional units.

7.2.2 Sending the ACCEPT SPDU

An S-CONNECT (accept) response results in an ACCEPT SPDU. If the symmetric synchronize functional unit is selected but the activity management functional unit is not selected, the SPM sets V(Ar) and V(Mr) to the First Initial Serial Number proposed by the called SS-user, which is the serial number to be used for the first received synchronization point. The SPM sets V(As) and V(Ms) to the Second Initial Serial Number proposed by the called SS-user, which is the serial number to be used for the first synchronization point to be sent. V(Rs) and V(Rr) are set to zero.

7.2.3 Receiving the ACCEPT SPDU

A valid incoming ACCEPT SPDU results in an S-CONNECT (accept) confirm. If the symmetric synchronize functional unit is selected but the activity management functional unit is not selected, the SPM sets V(As) and V(Ms) to the First Initial Serial Number contained in the ACCEPT SPDU, which is the serial number to be used for the first synchronization point to be sent. The SPM sets V(Ar) and V(Mr) to the Second Initial Serial Number contained in the ACCEPT SPDU, which is the serial number to be used for the first received synchronization point. V(Rs) and V(Rr) are set to zero.

7.18 MINOR SYNC POINT SPDU

When the symmetric synchronize functional unit has been selected, the MINOR SYNC POINT SPDU is used to define a minor synchronization point on one direction of data flow. A confirmation may be returned by the receiver but is not required by the SPM (see 7.19). In particular, whether confirmation is requested or not is transparent to the SPM.

The serial numbers are managed by the SS-provider and given to the SS-user. The right to issue a MINOR SYNC POINT SPDU is not subject to any token restrictions with the symmetric synchronize functional unit.

The following defines the content and processing of the MINOR SYNC POINT SPDU when the symmetric synchronize functional unit has been selected.

7.18.1 Content of MINOR SYNC POINT SPDU

The MINOR SYNC POINT SPDU contains:

- a) Sync Type Item parameter which is used to indicate if an explicit confirmation is required (see 7.19);
- b) Serial Number parameter which indicates the serial number of this minor synchronization point, and is set by the sending SPM to the current value of $V(Ms)$;
- c) User Data parameter which allows a limited amount of transparent user data to be transferred.

7.18.2 Sending the MINOR SYNC POINT SPDU

An S-SYNC-MINOR request results in a MINOR SYNC POINT SPDU. This SPDU is sent on the transport normal flow. $V(Ms)$ is incremented by one.

7.18.3 Receiving the MINOR SYNC POINT SPDU

A valid incoming MINOR SYNC POINT SPDU results in an S-SYNC-MINOR indication. $V(Mr)$ is incremented by one.

7.19 MINOR SYNC ACK SPDU

The MINOR SYNC ACK SPDU is used to return a confirmation to minor synchronization points. The SPM sends a MINOR SYNC ACK SPDU for each S-SYNC-MINOR response. When the symmetric synchronize functional unit has been selected, the local variable Vsc is not defined and its associated restrictions do not apply.

The following defines the content and processing of the MINOR SYNC ACK SPDU when the symmetric synchronize functional unit has been selected.

7.19.1 Content of MINOR SYNC ACK SPDU

The MINOR SYNC ACK SPDU contains:

- a) Serial Number parameter, provided by the SS-user which indicates the serial number of the received minor synchronization point which is being confirmed;
- b) User Data parameter which allows a limited amount of transparent user data to be transferred.

7.19.2 Sending the MINOR SYNC ACK SPDU

An S-SYNC-MINOR response (with serial number greater than or equal to V(Ar) and less than V(Mr)) results in sending a MINOR SYNC ACK SPDU. This SPDU is sent on the transport normal flow. The SPM sets V(Ar) equal to the serial number plus one.

7.19.3 Receiving the MINOR SYNC ACK SPDU

A valid incoming MINOR SYNC ACK SPDU (with received serial number greater than or equal to V(As) and less than V(Ms)) results in an S-SYNC-MINOR confirm. The SPM sets V(As) equal to the received serial number plus one.

7.20 MAJOR SYNC POINT SPDU

The MAJOR SYNC POINT SPDU is used to define a major synchronization point. A confirmation must be received before more data can be sent on the normal and expedited flow. The right to issue a MAJOR SYNC POINT SPDU is subject to the token restrictions specified in table 5.

If the symmetric synchronize functional unit has been selected, a major synchronization point is defined by two correlated serial numbers, one for each direction of data flow. One serial number is defined by the MAJOR SYNC POINT SPDU; this number is associated with the requestor's sending data flow. The other serial number is defined in the MAJOR SYNC ACK SPDU. This number is associated with the requestor's receiving flow. Together these two serial numbers completely separate the data flow before and after the major synchronization point. Both serial numbers are managed by the SS-provider and given to the SS-user.

The following defines the content and processing of the MAJOR SYNC POINT SPDU when the symmetric synchronize functional unit has been selected.

7.20.1 Content of MAJOR SYNC POINT SPDU

The MAJOR SYNC POINT SPDU contains:

- a) Sync Type Item parameter which is only present when indicating that this major synchronization point is not the end of the current activity;
- b) Serial Number parameter which indicates the serial number of this major synchronization point, and is set by the sending SPM to the current value of V(Ms);
- c) User Data parameter which allows a limited amount of transparent user data to be transferred.

7.20.2 Sending the MAJOR SYNC POINT SPDU

An S-SYNC-MAJOR request results in a MAJOR SYNC POINT SPDU. This SPDU is sent on the transport normal flow. V(Ms) is incremented by one. If the activity management functional unit has been selected, Vnextact is set true. If transport expedited is available to this session connection, the SPM waits for a PREPARE (MAJOR SYNC ACK) SPDU, followed by a MAJOR SYNC ACK SPDU. Otherwise, just a MAJOR SYNC ACK is expected. Any other SPDUs received prior to the MAJOR SYNC ACK SPDU will result in the appropriate service indications being given to the SS-user.

7.20.3 Receiving the MAJOR SYNC POINT SPDU

A valid incoming MAJOR SYNC POINT SPDU (with serial number in the SPDU equal to $V(Mr)$) results in an S-SYNC-MAJOR indication. $V(Mr)$ is incremented by one. If the activity management functional unit has been selected, $Vnextact$ is set true.

7.21 MAJOR SYNC ACK SPDU

The MAJOR SYNC ACK SPDU is used to return a confirmation to a major synchronization point. If the symmetric synchronize functional unit has been selected, this SPDU defines the serial number for the MAJOR SYNC POINT requestor's receiving flow.

The following defines the content and processing of the MAJOR SYNC ACK SPDU when the symmetric synchronize functional unit has been selected.

7.21.1 Content of MAJOR SYNC ACK SPDU

The MAJOR SYNC ACK SPDU contains:

- a) First Serial Number parameter which indicates the serial number of the major synchronization point for the requestor's sending flow. This is the number that was received in the MAJOR SYNC POINT SPDU and is equal to $V(Mr)$ minus one.
- b) Second Serial Number parameter which indicates the serial number of the major synchronization point for the requestor's receiving flow. This is the direction of flow on which the MINOR SYNC ACK SPDU travels. This number is set by the SPM to the current value of $V(Ms)$.
- c) User Data parameter which allows a limited amount of transparent user data to be transferred.

7.21.2 Sending the MAJOR SYNC ACK SPDU

An S-SYNC-MAJOR response (with First Serial Number equal to $V(Mr)$ minus one) results in a MAJOR SYNC ACK SPDU. This SPDU is sent on the transport normal flow. If the transport expedited flow is available to this session connection, a PREPARE (MAJOR SYNC ACK) SPDU is sent simultaneously, or earlier, on the transport expedited flow. $V(Ms)$ is incremented by one. Then $V(As)$ and $V(Rs)$ are set to $V(Ms)$; and $V(Ar)$ and $V(Rr)$ are set to $V(Mr)$. If the

activity management functional unit has been selected, Vact is set to Vnextact.

7.21.3 Receiving the MAJOR SYNC ACK SPDU

A valid incoming MAJOR SYNC ACK SPDU (with First Serial Number equal to V(Ms) minus one and Second Serial Number equal to V(Mr)) results in an S-SYNC-MAJOR confirm. V(Mr) is incremented.

If transport expedited is available to this session connection, two successive SPDUs will be received:

- a) PREPARE (MAJOR SYNC ACK) SPDU on the transport expedited flow, followed by
- b) MAJOR SYNC ACK SPDU on the transport normal flow.

V(As) and V(Rs) are set equal to V(Ms). V(Ar) and V(Rr) are set equal to V(Mr). If the activity management functional unit has been selected, Vact is set to Vnextact.

7.22 RESYNCHRONIZE SPDU

The RESYNCHRONIZE SPDU is used to provide the SS-users with a selective means to resynchronize the exchange of data to new synchronization point serial numbers for each direction of flow (when the symmetric synchronize functional unit is selected) and to reposition the tokens. Use of this procedure may result in loss of data.

The following options are provided:

- a) abandon;
- b) set;
- c) restart.

When the symmetric synchronize functional unit is selected, the SS-user specifies an option for each direction of flow on which resynchronization is requested.

When used with activity management, the RESYNCHRONIZE SPDU can only be sent when Vact is true.

The following defines the content and processing of the RESYNCHRONIZE SPDU when the symmetric synchronize functional unit has been selected.

7.22.1 Content of the RESYNCHRONIZE SPDU

The RESYNCHRONIZE SPDU contains:

- a) Token Setting Item which indicates the requestor's proposed token positions for all available tokens;
- b) First Resync Type Item parameter which indicates the resynchronize option for the requestor's sending flow (abandon, set or restart);
- c) First Serial Number parameter which indicates the serial number for the requestor's sending flow to which resynchronization is being requested. This serial number is supplied by the SS-user if the resynchronize option is set or restart. If the resynchronize option is abandon, the serial number is set to the value of V(Ms) of the sending SPM.
- d) Second Resync Type Item parameter which indicates the resynchronize option for the requestor's receiving flow (abandon, set or restart);
- e) Second Serial Number parameter which indicates the serial number for the requestor's receiving flow to which resynchronization is being requested. This serial number is supplied by the SS-user if the resynchronize option is set or restart. If the resynchronize option is abandon, the serial number is set to the value of V(Mr) of the sending SPM.
- f) User Data parameter which allows a limited amount of transparent user data to be transferred.

7.22.2 Sending the RESYNCHRONIZE SPDU

In an S-RESYNCHRONIZE request, the SS-user may specify one or both directions of flow. An S-RESYNCHRONIZE request results in a RESYNCHRONIZE SPDU.

If the S-RESYNCHRONIZE request specifies the sending flow, then the First Resync Item and the First Serial Number parameters are present in the RESYNCHRONIZE SPDU. If the First Resync Item is restart, then the First Serial Number must be greater than or equal to $V(R_s)$ and less than $V(M_s)$.

If the S-RESYNCHRONIZE request specifies the receiving flow, then the Second Resync Item and the Second Serial Number parameters are present in the RESYNCHRONIZE SPDU. If the Second Resync Item is restart, then the Second Serial Number must be greater than or equal to $V(R_r)$ and less than $V(M_r)$.

The RESYNCHRONIZE SPDU is sent on the transport normal flow. If the transport expedited flow is available to this session connection, a PREPARE (RESYNCHRONIZE) SPDU is sent simultaneously, or earlier, on the transport expedited flow. The PREPARE (RESYNCHRONIZE) SPDU carries the Resync Type Item for each direction of flow that is to be resynchronized. The Resync Type Item(s) in the PREPARE (RESYNCHRONIZE) are identical to the one(s) in the RESYNCHRONIZE SPDU.

If resynchronization has been requested for the receiving flow, then the SPM goes into a state where all the incoming SPDUs are discarded except PREPARE (RESYNCHRONIZE), RESYNCHRONIZE, PREPARE (RESYNCHRONIZE ACK), RESYNCHRONIZE ACK, ACTIVITY DISCARD, ACTIVITY INTERRUPT and ABORT SPDUs. If a RESYNCHRONIZE, PREPARE (RESYNCHRONIZE), ACTIVITY INTERRUPT or ACTIVITY DISCARD SPDU is received when the SPM is in this state, a resynchronization contention situation has occurred and is dealt with as specified in 7.22.4.

7.22.3 Receiving the RESYNCHRONIZE SPDU

When the symmetric synchronize functional unit is selected and transport expedited is available, two successive SPDUs will be received:

- a) the PREPARE (RESYNCHRONIZE) SPDU on the transport expedited flow, followed by
- b) RESYNCHRONIZE SPDU on the transport normal flow.

In this case, the PREPARE SPDU will carry the Resync Type Item for each direction of flow for which resynchronization is requested.

If the First Resync Type Item is present but the Second Resync Item is not present in the received PREPARE (RESYNCHRONIZE) SPDU, then

resynchronization has not been requested on the requestor's sending flow. In this case, DATA, TYPED DATA, MINOR SYNC POINT and MINOR SYNC ACK SPDUs are processed normally and the requestor's sending flow is not disturbed.

If the Second Resync Type Item is present, then resynchronization has been requested for the requestor's sending flow. In this case, all SPDUs received after the PREPARE (RESYNCHRONIZE) SPDU, except ABORT SPDU, are discarded until the RESYNCHRONIZE SPDU is received on the transport normal flow.

Note that if a PREPARE (RESYNCHRONIZE) SPDU is received with neither Resync Type Item present and the symmetric synchronize functional unit is selected, the PREPARE precedes an ACTIVITY INTERRUPT or ACTIVITY DISCARD SPDU and not a RESYNCHRONIZE SPDU. Both flows are affected, and processing occurs as specified in ISO 8327.

Except when a resynchronization contention situation has occurred, a valid incoming RESYNCHRONIZE SPDU results in an S-RESYNCHRONIZE indication.

If the First Resync Type Item is present and the option is restart, then the First Serial Number must be greater than or equal to $V(Rr)$ and less than $V(Mr)$. If the Second Resync Item is present and the option is restart, then the Second Serial Number parameter must be greater than or equal to $V(Rs)$ and less than $V(Ms)$.

If the First Resync Type Item is present and the option is abandon, the S-RESYNCHRONIZE indication contains a serial number which is equal to $V(Mr)$ or the received first serial number, whichever is higher; $V(Mr)$ is set to this value. If the Second Resync Type Item is present and the option is abandon, the S-RESYNCHRONIZE indication contains a serial number which is equal to $V(Ms)$ or the received second serial number, whichever is higher; $V(Ms)$ is set to this value.

The SPM now waits for an S-RESYNCHRONIZE response.

If a resynchronization contention situation has occurred, only the contention loser (see 7.22.4) passes an S-RESYNCHRONIZE indication to the SS-user.

7.22.4 Resynchronization contention

The contention between two RESYNCHRONIZE, ACTIVITY INTERRUPT, or ACTIVITY DISCARD SPDUs is resolved as described in ISO 8327 when the

symmetric synchronize functional unit is selected except in the case where two RESYNCHRONIZE SPDUs collide. When symmetric synchronization is selected and two RESYNCHRONIZE SPDUs collide, each direction of flow is considered separately.

If neither RESYNCHRONIZE SPDU carries a Resync Type parameter for a direction of flow, then that direction of flow is not affected by the resynchronization.

If only one RESYNCHRONIZE SPDU carries a Resync Type parameter for a direction of flow, then the result for that direction of flow is the Resync Type and associated Serial Number in that SPDU.

If the two RESYNCHRONIZE SPDUs carry different Resync Types for a direction of flow, then the result for that direction of flow is the requested Resync Type (and its associated serial number) listed first in the in list below:

- a) abandon;
- b) set;
- c) restart.

If both RESYNCHRONIZE SPDUs offer the same Resync Type for a direction of flow, then the result is that Resync Type and the serial number as defined below:

- d) If both RESYNCHRONIZE SPDUs specify abandon, the result for that direction of flow is the higher of the two serial numbers in the SPDUs.
- e) If both RESYNCHRONIZE SPDUs specify set, the result for that direction of flow is the serial number in the SPDU sent by the calling SPM.
- f) If both RESYNCHRONIZE SPDUs specify restart, the result for that direction of flow is the lower of the two serial numbers in the SPDUs.

If all results for the affected direction(s) of flow were provided in the RESYNCHRONIZE SPDU sent by one and only one SPM, then that SPM "wins" the contention and the RESYNCRHONIZE SPDU sent by the other SPM is discarded. Otherwise, the Resync Type and Serial Number results replace the appropriate parameters in the RESYNCHRONIZE SPDU sent by the calling SPM.