

Information technology — Open Systems Interconnection — Distributed Transaction Processing —

Part 2: OSI TP service

ICS 35.100.70

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee IST/6, Data communications, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the ISO/IEC title page, pages ii to vi, pages 1 to 134 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Amendments issued since publication

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INTERNATIONAL STANDARD

**ISO/IEC
10026-2**

Third edition
1998-10-15

Information technology — Open Systems Interconnection — Distributed Transaction Processing —

Part 2: OSI TP Service

*Technologies de l'information — Interconnexion de systèmes ouverts
(OSI) — Traitement transactionnel réparti —*

Partie 2: Service OSI TP



Reference number
ISO/IEC 10026-2:1998(E)



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Descriptors: Data processing, information interchange, network interconnection, open systems interconnection, application layer, communication procedure, control procedures, services.

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 10026-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 21, *Open systems interconnection, data management and open distributed processing*.

This third edition cancels and replaces the second edition (ISO/IEC 10026-2:1996), which has been technically revised.

This part of ISO/IEC 10026 is technically aligned with ITU-T Recommendation X.861, but is not published as identical text.

ISO/IEC 10026 consists of the following parts, under the general title *Information technology — Open Systems Interconnection — Distributed Transaction Processing*:

- *Part 1: OSI TP Model;*
- *Part 2: OSI TP Service;*
- *Part 3: Protocol specification;*
- *Part 4: Protocol Implementation Conformance Statement (PICS) proforma;*
- *Part 5: Application context proforma and guidelines when using OSI TP;*
- *Part 6: Unstructured Data Transfer.*

Annex A forms an integral part of this part of ISO/IEC 10026. Annex B is for information only.

Introduction

ISO/IEC 10026 is one of a set of standards produced to facilitate the interconnection of computer systems. It is related to other International Standards in the set as defined by the Reference Model for Open Systems Interconnection (ISO/IEC 7498-1). The Reference Model subdivides the area of standardization for interconnection into a series of layers of specification, each of manageable size.

The aim of Open Systems Interconnection is to allow, with a minimum of technical agreement outside the interconnection standards, the interconnection of computer systems

- a) from different manufacturers;
- b) under different management;
- c) of different levels of complexity; and
- d) of different technologies.

ISO/IEC 10026 defines an OSI TP Model, an OSI TP Service and specifies an OSI TP Protocol available within the Application Layer of the OSI Reference Model.

The OSI TP Service is an Application Layer service. It is concerned with information which can be related as distributed transactions, which involve two or more open systems.

This part of ISO/IEC 10026 defines a basic OSI TP Service. It provides sufficient facilities to support transaction processing, and establishes a framework for coordination across multiple TP resources in separate open systems.

ISO/IEC 10026 does not specify the interface to local resources or access facilities that are provided within the local system. However, future enhancement of the standard may deal with these issues.

1 Scope

This part of ISO/IEC 10026 defines in an abstract way the Distributed Transaction Processing Service within the Application Layer in terms of:

- a) the actions and events of the service primitives;
- b) the parameter data associated with each service primitive's action and event; and
- c) the relationship between, and the valid sequences of these actions and events.

It does not specify individual implementations or products, nor does it constrain the implementation of entities or interfaces within a computer system.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 10026. 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 10026 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 7498-1:1994, *Information technology — Open Systems Interconnection — Basic Reference Model: The Basic Model*.

ISO/IEC 7498-3:1997, *Information technology — Open Systems Interconnection — Basic Reference Model: Naming and addressing*.

ISO/IEC 8649:1996, *Information technology — Open Systems Interconnection — Service definition for the Association Control Service Element*.

ISO/IEC 10026-1:1998, *Information technology — Open Systems Interconnection — Distributed Transaction Processing — Part 1: OSI TP Model*.

ISO/IEC 10026-3:1998, *Information technology — Open Systems Interconnection — Distributed Transaction Processing — Part 3: Protocol specification*.

ISO/IEC 10731:1994, *Information technology — Open Systems Interconnection — Basic Reference Model — Conventions for the definition of OSI services*.

3 Definitions

For the purposes of this part of ISO/IEC 10026, the definitions given in ISO/IEC 10026-1 and the following definitions apply.

3.1

dialogue establishment indication outstanding

a dialogue state in which a TP-BEGIN-DIALOGUE indication with the Confirmation parameter set to “always” has been issued but has not yet been responded to by a TP-BEGIN-DIALOGUE response

3.2

dialogue establishment request outstanding

a dialogue state in which a TP-BEGIN-DIALOGUE request with the Confirmation parameter set to “always” has been issued but has not yet been responded to by a TP-BEGIN-DIALOGUE confirm

3.3

dialogue termination indication outstanding

a dialogue state in which a TP-END-DIALOGUE indication with the Confirmation parameter set to “true” has been issued while there is no *user error request outstanding*, but has not yet been responded to by a TP-END-DIALOGUE response, or by a TP-U-ERROR request

3.4

dialogue termination request outstanding

a dialogue state in which a TP-END-DIALOGUE request with the Confirmation parameter set to “true” has been issued, but has not yet been responded to by a TP-END-DIALOGUE confirm, or by a TP-U-ERROR indication

3.5

exclusive branch

a transaction branch on which one of the following is true:

- the dialogue is with the superior, *ready can be sent*, and either:
 - *ready can not be received*; or
 - there is *tree checking* at the node;
- the dialogue is with a subordinate, *ready can be sent*, *ready can not be received*, and either:
 - the Read-only functional unit is not selected and the Early-exit functional unit is not selected; or
 - there is *tree checking* at the node; or
- the dialogue is with a subordinate and the coordination level is “one-phase commitment” and either:
 - the Read-only functional unit is not selected and the Early-exit functional unit is not selected; or
 - there is *tree checking* at the node;

and if the Unchained Transactions functional unit is selected, none of the following service primitives have been issued during the current transaction: TP-READY indication, TP-READ-ONLY indication, TP-ONE-PHASE indication, or TP-EARLY-EXIT indication

3.6

handshake indication outstanding

a dialogue state in which one of the following service primitives:

- TP-HANDSHAKE indication;
- TP-HANDSHAKE-AND-GRANT-CONTROL indication;

has been issued while there is no *user error request outstanding*, but has not yet been responded to by one of the following service primitives (respectively):

- TP-HANDSHAKE response;
- TP-HANDSHAKE-AND-GRANT-CONTROL response;

or by a TP-U-ERROR request, or, if *the dialogue is coordinated*, by a TP-EARLY-EXIT request or a TP-EARLY-EXIT indication or any *rollback-initiating service primitive*

3.7**handshake request outstanding**

a dialogue state in which one of the following service primitives:

- TP-HANDSHAKE request;
- TP-HANDSHAKE-AND-GRANT-CONTROL request;

has been issued, but has not yet been responded to by one of the following service primitives (respectively):

- TP-HANDSHAKE confirm;
- TP-HANDSHAKE-AND-GRANT-CONTROL confirm;

or by a TP-U-ERROR indication, or, if *the dialogue is coordinated*, by a TP-EARLY-EXIT request or a TP-EARLY-EXIT indication or any *rollback-initiating service primitive*

3.8

ready can be received (on a branch) if the branch is with a superior and *superior can send ready* on the branch, or the branch is with a subordinate and *subordinate can send ready* on the branch

3.9

ready can be sent (on a branch) if the branch is with a superior and *subordinate can send ready* on the branch or the branch is with a subordinate and *superior can send ready* on the branch

3.10**rollback-initiating indication**

an indication or confirm that triggers a rollback; it is one of the following service primitives:

- TP-ROLLBACK indication;
- TP-U-ABORT indication with the Rollback parameter set to “true”;
- TP-P-ABORT indication with the Rollback parameter set to “true”;
- TP-BEGIN-DIALOGUE confirm with the Rollback parameter set to “true”.

3.11**rollback-initiating request**

a request that triggers a rollback; it is one of the following service primitives:

- TP-ROLLBACK request;
- TP-U-ABORT request for a *coordinated dialogue* not issued during the *termination phase of a transaction* and neither a TP-READ-ONLY indication nor a TP-EARLY-EXIT indication has been issued for the dialogue.

3.12**rollback-initiating service primitive**

a service primitive that triggers a rollback; it may be either a *rollback-initiating request* or a *rollback-initiating indication*

3.13**static one-phase exclusive branch**

an *exclusive branch* on which the coordination level is “one-phase commitment”

NOTE this is only defined for a branch to a subordinate.

3.14**subordinate dialogue**

a dialogue with a subordinate

3.15

subordinate can send ready (on a branch) if the branch is with a subordinate and the Commit functional unit is selected and the Dynamic Commit functional unit is not selected, or the Dynamic Commit functional unit is selected and the Subordinate-may-send-ready parameter of TP-BEGIN-DIALOGUE request was set to “true”

3.16**subordinate subtree**

a subtree of a subordinate

3.17

superior can send ready (on a branch) if the branch is with the superior and the Dynamic Commit functional unit is selected and the Superior-may-send-ready parameter of TP-BEGIN-DIALOGUE indication was set to “true”

3.18

superior dialogue

the dialogue with the superior

3.19

termination phase of a transaction; termination phase

the phase of a transaction between initiation of commitment or rollback and the end of the transaction

this phase is entered, for a given TPSUI, upon issuance of a *transaction completion request* or a TP-EARLY-EXIT request or any *rollback-initiating service primitive*

for a TPSUI which does not have a *dialogue establishment indication outstanding*, this phase is exited upon issuance of a TP-COMMIT-COMplete indication or a TP-UNKNOWN-COMplete indication or a TP-ROLLBACK-COMplete indication

for a TPSUI which does have a *dialogue establishment indication outstanding* when the termination phase is entered (this can only happen when a TP-ROLLBACK indication is issued), this phase is exited by a TP-BEGIN-DIALOGUE response with the Result parameter set to “rejected(user)” or by a TP-P-ABORT indication for the dialogue; if the dialogue is accepted during the termination phase, the termination phase is exited by the subsequent TP-ROLLBACK-COMplete indication

3.20

TPSUI owes a TP-DONE request

this obligation is created by the issuing of certain indications and confirmations during termination of a transaction; the TPSUI must issue a TP-DONE request before the transaction can be completed

3.21

transaction completion request

a service request which triggers completion (rather than rollback) of a transaction; it is one of the following service primitives:

- TP-COMMIT request;
- TP-READ-ONLY request;
- TP-ONE-PHASE request.

3.22

transaction subordinate

a TPSUI which is the subordinate for a *coordinated dialogue*

3.23

transaction superior

a TPSUI which is the superior for one or more *coordinated dialogues*

3.24

transaction tree constraint

a constraint that cannot be checked at a single node

3.25**tree checking**

there is tree checking at a node if there is a transaction branch from the superior on which either:

ready can be sent and *ready can be received* and the Check-ready-directions parameter of the TP-BEGIN-DIALOGUE indication or the TP-BEGIN-TRANSACTION indication for the current transaction was absent or set to “true”; or

ready can be sent, and *ready can not be received*.

there may also be tree checking at a node (including at a root node) as the result of a local decision

NOTE this would typically occur as the result of configuration information on a real open system.

3.26**two-phase expected branch**

a transaction branch on a *coordinated dialogue* with a subordinate, on which *ready can be received* and either:

- none of the One-phase, Read-only, and Early-exit functional units are selected; or
- the Unchained Transactions functional unit is selected, there is *tree checking* at the node, and none of the following service primitives have been issued during the current transaction: TP-ONE-PHASE indication, TP-READ-ONLY indication, or TP-EARLY-EXIT indication.

3.27**user error indication outstanding**

a state of a dialogue with the Polarized Control functional unit selected. In this state, a TP-U-ERROR indication, issued while the recipient had control of the dialogue and has neither a *handshake request outstanding* nor a *dialogue termination request outstanding*, has not yet been responded to by a TP-GRANT-CONTROL request, or, if *the dialogue is coordinated*, by a TP-EARLY-EXIT request or a TP-EARLY-EXIT indication or any *rollback-initiating service primitive*

3.28**user error request outstanding**

a state of a dialogue with the Polarized Control functional unit selected. In this state, a TP-U-ERROR request, issued without having control of the dialogue and without having either a *handshake indication outstanding* or a *dialogue termination indication outstanding*, has not yet been responded to by a TP-GRANT-CONTROL indication, a TP-HANDSHAKE indication, a TP-HANDSHAKE-AND-GRANT-CONTROL indication, a TP-END-DIALOGUE indication with the Confirmation parameter set to “true”, or, if *the dialogue is coordinated*, by a TP-EARLY-EXIT request or a TP-EARLY-EXIT indication or any *rollback-initiating service primitive*

4 Abbreviations

Abbreviations used in this part of ISO/IEC 10026 are defined in ISO/IEC 10026-1 (OSI TP Model), except for the following which are used in some tables:

cnf	confirm service primitive;
ind	indication service primitive;
req	request service primitive;
rsp	response service primitive.

5 Conventions

5.1 Service conventions

This part of ISO/IEC 10026 defines services for Distributed Transaction Processing guided by the descriptive conventions defined in ISO/IEC 10731.

However, the terms “request” and “indication” are sometimes used in the following ways:

a single request may result in multiple indications (an example is that a single TP-COMMIT request may result in TP-PREPARE indications to each direct subordinate TPSUI);

several requests may result in a single indication (an example is that a single TP-COMMIT-COMplete indication may be issued to a superior TPSUI only after TP-DONE requests have been issued by this TPSUI and by all subordinate TPSUIs in the transaction tree);

the convention that a request primitive results in an indication primitive of the same name, is not always followed (for example, the issuance of a TP-COMMIT request may cause a TP-PREPARE indication to be issued).

NOTE In this part of ISO/IEC 10026, requests and responses are described as being issued by the TPSUI whereas indications and confirms are described as being issued by the TPSP.

For a given primitive, the presence of each parameter is described by one of the following values:

blank:	not applicable;
M:	presence is mandatory;
U:	presence is a user option;
O:	presence is a provider option; and,
C:	presence is conditional.

In addition the notation (=) indicates that a parameter value is semantically equal to the value of the parameter of the preceding primitive in the table.

5.2 Usage of the term transaction

In this part of ISO/IEC 10026, the term “transaction” is used to denote a distributed provider-supported transaction.

5.3 Usage of italics for notations

In this part of ISO/IEC 10026, the following notations, defined in clause 3 or in 10026-1, appear in italics:

commitment hinterland;
coordinated dialogue; dialogue is coordinated;
dialogue establishment indication outstanding;
dialogue establishment request outstanding;
dialogue termination indication outstanding;
dialogue termination request outstanding;
exclusive branch;
handshake indication outstanding;
handshake request outstanding;
ready can be received;
ready can be sent;
rollback-initiating indication;
rollback-initiating request;
rollback-initiating service primitive;
static one-phase exclusive branch;
subordinate can send ready;
subordinate dialogue;
subordinate subtree;
superior can send ready;
superior dialogue;

termination phase [of a transaction];
there is tree checking;
TPSUI owes a TP-DONE request;
transaction completion request;
transaction hinterland;
transaction subordinate;
transaction superior;
transaction tree constraint;
two-phase expected branch;
user error indication outstanding;
user error request outstanding.

6 Overview of the OSI TP Service

The Distributed Transaction Processing Service and its supporting protocol are concerned with creating an environment in which two or more users may interact to

- a) establish dialogues;
- b) invoke services of specific user application service elements, subject to the constraints of the TPSP;
- c) delimit provider-supported transactions;
- d) coordinate work for application-supported transactions or provider-supported transactions;
- e) prepare for commitment, and commit or roll back a provider-supported transaction;
- f) heuristically place bound data either in the final or initial state;
- g) report errors;
- h) terminate dialogues allowing all resources allocated to these dialogues to be freed;
- i) terminate dialogues abnormally;
- j) synchronize processing by handshaking;
- k) support chained or unchained sequences of provider-supported transaction branches for a dialogue.

A node crash may result in the TPSP issuing certain TP service primitives more than once (i.e., TP-COMMIT indication, TP-ROLLBACK indication, and TP-HEURISTIC-REPORT indication). The TPSP and the TPSUI are both aware of the node crash through local means.

7 Service facilities

7.1 Functional unit descriptions

The following functional units are defined:

- a) **Dialogue:** the Dialogue functional unit supports the basic services required to establish a dialogue between two TPSUIs within which U-ASE primitives may be invoked, signal user-initiated errors and terminate the dialogue. The user or the provider may signal abnormal termination;
- b) **Shared Control:** the Shared Control functional unit supports both TPSUIs having control of the dialogue at the same time and allows them to issue request primitives subject only to the normal sequencing constraints of the primitives. For example, data may be transferred by both TPSUIs at the same time;
- c) **Polarized Control:** the Polarized Control functional unit allows only one TPSUI to have control of the dialogue at any point in time. Many request primitives may be issued only by the TPSUI which has control of the dialogue. This restriction is in addition to the normal sequencing constraints for the primitives. For example, a handshake may only be requested by the TPSUI which has control of the dialogue;
- d) **Handshake:** the Handshake functional unit allows the TPSUIs to synchronize their processing with one another;
- e) **Commit:** the Commit functional unit allows reliable commitment and rollback of transactions;

- f) **Chained Transactions:** the Chained Transactions functional unit supports coordination of both TPSUIs with a chained sequence of transaction branches. The coordination level of the dialogue will always be “commitment” or “one-phase commitment”. The subordinate TPSUI will always be a participant in the same transaction as the superior TPSUI;
- g) **Unchained Transactions:** the Unchained Transactions functional unit supports coordination of both TPSUIs with an unchained sequence of transaction branches. The superior determines when the coordination level of the dialogue is “commitment” or “one-phase commitment”. At a given point in time, the two TPSUIs may be participants in the same transaction, in different transactions, or one or both TPSUIs may not be involved in a transaction;
- h) **Dynamic Commit:** the Dynamic Commit functional unit allows the reliable commitment of a transaction to be organised in a way which is not limited by the orientation of the supporting dialogue tree;
- i) **Unchecked Tree:** the Unchecked Tree functional unit allows the suppression of TPSP checks on the construction of transaction trees when the Dynamic Commit functional unit is selected;
- j) **Implicit Prepare:** the Implicit Prepare functional unit allows the signal that the transaction is to be completed to be carried in application semantics such that an explicit TP service indication may not be required;
- k) **Read-only:** the Read-only functional unit allows a TPSUI which has completed processing of all work related to a transaction to request that it withdraw from participation in the transaction if it has not modified its bound data;
- l) **Early-exit:** the Early-exit functional unit allows a TPSUI to indicate that it is unable to contribute to the work of a transaction, its bound data has not been modified, and that the TPSUI has no preference as to whether the transaction commits or is rolled back;
- m) **One-phase Commit:** the One-phase Commit functional unit allows a TPSUI that has no requirement for reliable reporting of the outcome of a transaction to request one-phase termination of that transaction;
- n) **Completion Diagnostics:** the Completion Diagnostics functional unit allows a TPSUI to signal information related to the completion of a transaction to its superior TPSUI in the transaction tree, including the severity and reason for a rollback request;
- o) **Heuristic Containment Required:** the Heuristic Containment Required functional unit allows a TPSUI to require its subordinate to contain heuristic conditions; as a result the TPSUI will not receive heuristic reports from the subordinate.

The Dialogue functional unit shall always be selected.

For a given dialogue, the Shared Control and Polarized Control functional units are mutually exclusive. One and only one of these two functional units shall be selected.

For a given dialogue, the One-phase Commit functional unit may be selected alone (static one-phase commit) or together with both of the Commit and Dynamic Commit functional units (dynamic one-phase commitment).

For a given dialogue, the Chained Transactions and Unchained Transactions functional units are mutually exclusive. If either or both of the Commit or One-phase Commit functional units are selected, one and only one of the Chained Transactions and Unchained Transactions functional units shall be selected. If neither the Commit nor the One-phase Commit functional unit is selected, neither one of the Chained Transactions or Unchained Transactions functional units shall be selected.

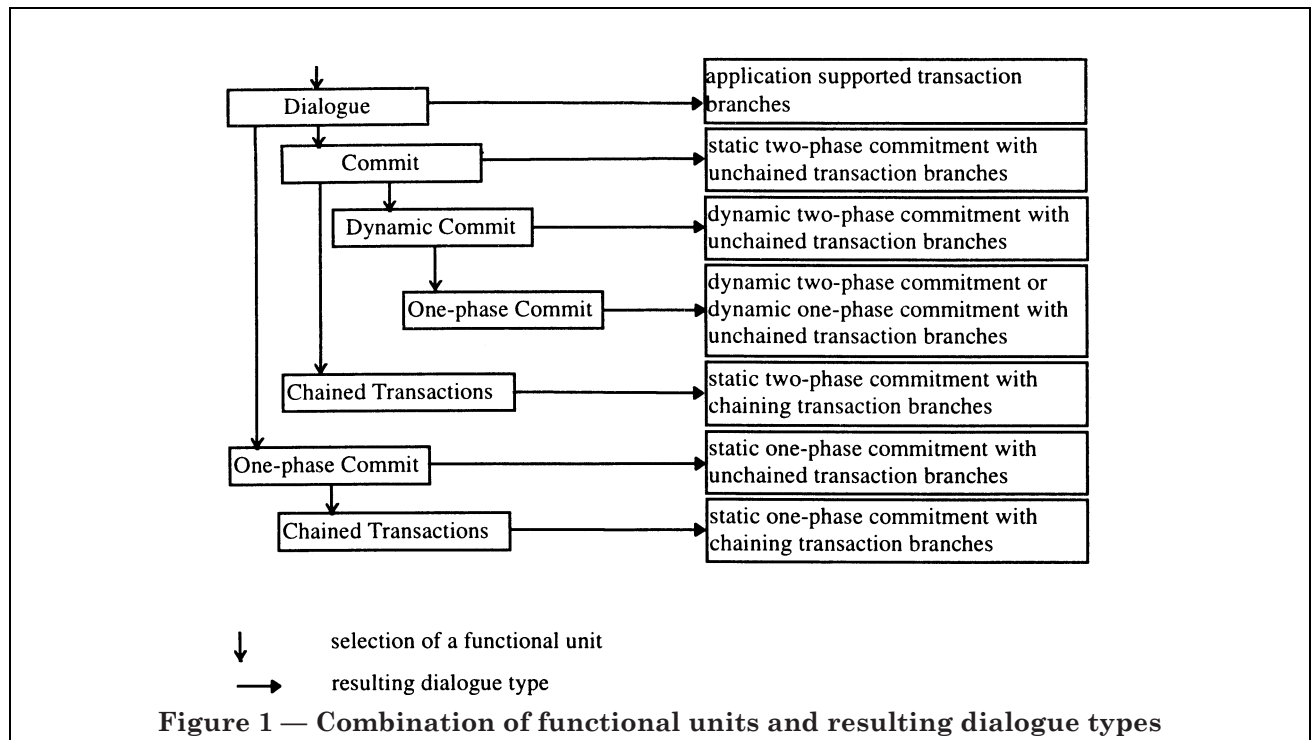
For a given dialogue, if the Commit functional unit is selected, then one or more of the following functional units may also be selected in any combination: Implicit Prepare, Read-only, Early-exit, Completion Diagnostics, Heuristic Containment Required.

For a given dialogue, if the One-phase Commit functional unit is selected and the Commit functional unit is not selected, then one or more of the following functional units may also be selected in any combination: Implicit Prepare, Read-only, Early-exit, Completion Diagnostics, Heuristic Containment Required.

For a given dialogue, only if the Commit and Unchained Transactions functional units are selected may the Dynamic Commit functional unit be selected. If the Dynamic Commit functional unit is selected, then the Unchecked Tree functional unit may also be selected.

NOTE There are multi-dialogue constraints on functional units, which apply when transaction branches are created by TP-BEGIN-DIALOGUE request or TP-BEGIN-TRANSACTION request. For example, the static one-phase commit capability may be selected for a subordinate transaction branch only if there is no superior transaction branch. Such constraints are defined in the descriptions of the relevant services.

With the rules given above the following dialogue types are valid:



The dialogue functional unit must always be selected. Then, following one of the vertical arrows, if any, means that the selection process is continued. If the selection process stops (i.e. there is no further choice or one chooses not to proceed), then the resulting dialogue type is given on the right hand side.

7.2 Services contained in functional units

Table 1 lists the functional units and the associated services.

Table 1 — Functional units and their services

Functional Unit	Services
Dialogue	TP-BEGIN-DIALOGUE TP-END-DIALOGUE ^a TP-U-ERROR TP-U-ABORT TP-P-ABORT
Shared Control	(no associated services)
Polarized Control	TP-GRANT-CONTROL TP-REQUEST-CONTROL
Handshake	TP-HANDSHAKE TP-HANDSHAKE-AND-GRANT-CONTROL ^b
Commit	TP-DEFERRED-END-DIALOGUE TP-DEFERRED-GRANT-CONTROL ^b TP-PREPARE TP-READY TP-COMMIT TP-DONE TP-COMMIT-COMplete TP-ROLLBACK TP-ROLLBACK-COMplete TP-HEURISTIC-REPORT
Chained Transactions	(no associated services)
Unchained Transactions	TP-BEGIN-TRANSACTION
Dynamic Commit	(no associated services)
Unchecked Tree	(no associated services)
Implicit Prepare	(no associated services)
Read-only	TP-READ-ONLY TP-UNKNOWN TP-UNKNOWN-COMplete
Early-exit	TP-EARLY-EXIT TP-UNKNOWN TP-UNKNOWN-COMplete
One-phase Commit	TP-DEFERRED-END-DIALOGUE TP-DEFERRED-GRANT-CONTROL ^b TP-PREPARE TP-COMMIT ^c TP-DONE TP-COMMIT-COMplete TP-ROLLBACK TP-ROLLBACK-COMplete TP-HEURISTIC-REPORT TP-ONE-PHASE TP-UNKNOWN TP-UNKNOWN-COMplete
Completion Diagnostics	TP-COMPLETION-REPORT
Heuristic Containment Required	(no associated services)
^a This service shall not be used if the Chained Transactions functional unit is selected. ^b This service may be used only if the Polarized Control functional unit is also selected. ^c TP-COMMIT request shall be used by a node when the One-phase Commit functional unit is selected on the <i>superior dialogue</i> and the node has bound data even if the Commit functional unit is not also selected.	

7.3 Service for modelling data transfer

Table 2 shows the service for modelling data transfer.

Table 2 — Service for modelling data transfer

Data Transfer	TP-DATA
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TP-DATA is not a service in the normal sense. It represents the capability of a TPSUI to invoke specific U-ASE services on a dialogue, constrained by the TPSP.

7.4 Structure of service descriptions

7.4.1 “Purpose” subclause

The “Purpose” subclause describes, in a few words, the purpose of the service.

7.4.2 “Service and parameters” subclause

The “Service and parameters” subclause describes the service primitives and their parameters.

The constraints or conditions on the presence or values of these parameters are described in this subclause.

7.4.3 “Sequences of primitives” subclause

The “Sequence of primitives” subclause is included for certain services; it shows the relationship in time between the service request and the resulting indication, and, if applicable, the subsequent response and the resulting confirm.

7.4.4 “TPSUI conditions” subclause

The “TPSUI conditions” subclause applies to certain requests and responses only; it specifies prerequisites for the respective request or response to be issued by the TPSUI. TPSUI conditions cannot be monitored by the TPSP, nevertheless it is vital for orderly cooperation of the TPSUI and for atomicity that they are obeyed.

TPSUI conditions include

- the state of bound data;
- the success of synchronization.

7.4.5 “TPSP constraints” subclause

The “TPSP constraints” subclause applies to all service primitives. For request and response service primitives, it specifies prerequisites for issuance by the TPSUI that are enforced by the TPSP. For indication and confirm service primitives, it specifies constraints on the issuance of the service primitives by the TPSP. Constraints on the values of parameters for service primitives are described separately in the “Service and parameters” subclause for each service.

In general, the constraints are based on information associated with the state of the TPSUI at the time the service primitive is issued. Constraints for service primitives that are associated with a particular dialogue relate only to that dialogue unless the constraints explicitly reference other dialogues or attributes that are not related to a particular dialogue.

Information on which constraints are based includes

- functional units selected for a dialogue;
- superior or subordinate status;
- control of the dialogue;
- coordination level;
- state of bound data;
- transaction state;
- sequence of service primitives and associated parameter values.

7.4.6 “Effects of a service primitive” subclause

The “Effects of a service primitive” subclause describes any effects on the characteristics of the dialogue or the transaction resulting from the issuance of a service primitive.

Effects include

- initiating or terminating the dialogue or the transaction;
- control of the dialogue;
- superior or subordinate status;
- change of the coordination level;
- in the case of a request or response, the issuance of resulting service primitives.

NOTE Effects of a service primitive on certain lower layers facilities (e.g. Session tokens) are described in ISO/IEC 10026-3.

7.4.7 “Collisions” subclause

There is a collision of two requests if the requests have been issued:

- on opposite sides of the same dialogue; and
- before the indication resulting from the request issued on the other side is either issued or suppressed.

The “Collisions” subclause describes any effects on a service request or response caused by collision with a service primitive issued by the partner TPSUI.

NOTE thus a collision subclause does not appear for an indication or confirm primitive.

In general, the effects of a collision involving a particular service are described in the “Collisions” subclause for that service.

These effects include

- suppression of an indication;
- generation of a different indication.

7.5 Effects of dialogue termination

Whenever a dialogue is terminated for a particular TPSUI, no further service primitives are issued to the TPSUI for the dialogue, except TP-HEURISTIC-REPORT indication, which may be issued during the *termination phase of the transaction*.

For a particular TPSUI, a dialogue is terminated by one of the following service primitives:

- TP-END-DIALOGUE request with the Confirmation parameter set to “false”;
- TP-END-DIALOGUE indication with the Confirmation parameter set to “false”;
- TP-END-DIALOGUE response;
- TP-END-DIALOGUE confirm;
- TP-BEGIN-DIALOGUE response with the Result parameter set to “rejected(user)”;
- TP-BEGIN-DIALOGUE confirm with the Result parameter set to “rejected(provider)” or “rejected(user)”;
- TP-U-ABORT request;
- TP-U-ABORT indication;
- TP-P-ABORT indication;
- TP-COMMIT-COMplete indication when a TP-DEFERRED-END-DIALOGUE request or indication has been issued;
- TP-UNKNOWN-COMplete indication when a TP-DEFERRED-END-DIALOGUE indication has been issued and a TP-EARLY-EXIT request has not been issued;
- TP-UNKNOWN-COMplete indication when a TP-DEFERRED-END-DIALOGUE request has been issued and a TP-EARLY-EXIT indication has not been issued.

Suppression of subsequent service primitives is not described in the collisions subclauses.

8 Service primitives and their parameters

The OSI TP Service is invoked using a sequence of OSI TP service primitives.

Table 3 lists

- the service primitives of the OSI TP Service;
- for each service primitive, whether the service primitive is associated with a particular dialogue or with the TPSUI as a whole;
- the subclause in which the service primitive is described; and,
- the parameters associated with each service.

Blanks in the parameters column indicates that the service primitive has no parameters.

Table 3 — OSI TP service primitives

Services	Primitives	Scope	Subclause	Parameters
TP-BEGIN-DIALOGUE	req/ind/rsp/cnf	Dialogue	10.2	Initiating-AP-Title Initiating-API-Identifier Initiating-AE-Qualifier Initiating-AEI-Identifier Initiating-TPSU-Title Recipient-AP-Title Recipient-API-Identifier Recipient-AE-Qualifier Recipient-AEI-Identifier Recipient-TPSU-Title Functional-Units Quality-of-Service Application-Context-Name Begin-Transaction Confirmation Result Diagnostic Rollback Superior-may-send-ready Subordinate-may-send-ready Check-ready-directions User-Data
TP-END-DIALOGUE	req/ind/rsp/cnf	Dialogue	10.3	Confirmation
TP-U-ERROR	req/ind	Dialogue	10.4	
TP-U-ABORT	req/ind	Dialogue	10.5	Rollback User-Data
TP-P-ABORT	ind	Dialogue	10.6	Diagnostic Rollback
TP-GRANT-CONTROL	req/ind	Dialogue	12.2	
TP-REQUEST-CONTROL	req/ind	Dialogue	12.3	
TP-HANDSHAKE	req/ind/rsp/cnf	Dialogue	13.2	Confirmation-Urgency
TP-HANDSHAKE-AND-GRANT-CONTROL	req/ind/rsp/cnf	Dialogue	13.3	Confirmation-Urgency
TP-BEGIN-TRANSACTION	req/ind	Dialogue	14.5	Check-ready-direction
TP-DEFERRED-END-DIALOGUE	req/ind	Dialogue	14.6	

Table 3 — OSI TP service primitives

Services	Primitives	Scope	Subclause	Parameters
TP-DEFERRED-GRANT-CONTROL	req/ind	Dialogue	14.7	
TP-PREPARE	req	Dialogue	14.8	Data-Permitted
TP-PREPARE	ind	Dialogue	14.9	Data-Permitted
TP-READY	ind	Dialogue	14.10	
TP-COMMIT	req	TPSUI	14.11	
TP-COMMIT	ind	TPSUI	14.12	
TP-DONE	req	TPSUI	14.13	Heuristic-Report Severity Completion-Data
TP-COMMIT-COMPLETE	ind	TPSUI	14.14	
TP-ROLLBACK	req	TPSUI	14.15	
TP-ROLLBACK	ind	TPSUI	14.16	Severity Diagnostic
TP-ROLLBACK-COMPLETE	ind	TPSUI	14.17	
TP-HEURISTIC-REPORT	ind	Dialogue	14.18	Heuristic-Report
TP-READ-ONLY	req	TPSUI	14.19	Confirmation-Urgency
TP-READ-ONLY	ind	Dialogue	14.20	
TP-EARLY-EXIT	req	TPSUI	14.21	Severity User-Data
TP-EARLY-EXIT	ind	Dialogue	14.22	Severity User-Data
TP-ONE-PHASE	req	TPSUI	14.23	
TP-ONE-PHASE	ind	Dialogue	14.24	
TP-UNKNOWN	ind	TPSUI	14.25	
TP-UNKNOWN-COMPLETE	ind	TPSUI	14.26	
TP-COMPLETION-REPORT	ind	Dialogue	14.27	Severity Completion-Data Diagnostic
NOTE The method for identifying the appropriate dialogue for the service primitives which are associated with a particular dialogue is a local matter.				

9 Data transfer

9.1 Overview of data transfer

Data transfer is performed within the framework of OSI TP by issuance of the service primitives offered by one or more U-ASEs. To specify the coordination between these service primitives and OSI TP service primitives, these U-ASE service primitives are modelled as TP-DATA.

NOTE TP-DATA may not only be used to model data transfer but also to model any other U-ASE services that may be constrained by the TPSP (see ISO/IEC 10026-3 for constraints on such services).

9.2 Data transfer service, TP-DATA

9.2.1 Purpose

This service represents the capability of a TPSUI to transfer data. From the standpoint of the TPSP, it is used to specify the coordination between data transfer and other OSI TP services.

This service is never invoked as such, but is used in the OSI TP Service Definition to represent any U-ASE service primitive within the OSI TP framework.

This service is associated with one particular dialogue.

9.2.2 Primitives and parameters

Table 4 lists the TP-DATA primitives.

Table 4 — TP-DATA primitives and parameters

TP-DATA		
parameters defined in the U-ASE	req	ind

NOTE TP-DATA is modelled as an unconfirmed service. This is not meant to exclude the possibility of other types of services (e.g. confirmed services).

9.2.3 TPSP constraints on TP-DATA request

The requestor shall not have a *dialogue establishment indication outstanding*.

The requestor shall have control of the dialogue; or, if the Polarized Control functional unit is selected, the *dialogue shall be coordinated* and a TP-PREPARE indication with the Data-Permitted parameter set to “true” shall have been issued during the current transaction.

The requestor shall not have a *handshake request outstanding*.

The requestor shall not have a *user error indication outstanding*.

The requestor shall have neither a *dialogue termination request outstanding* nor a *dialogue termination indication outstanding*.

If the *dialogue is coordinated*, none of the following services shall have been issued during the current transaction:

- TP-PREPARE request;
- TP-READY indication;
- TP-READ-ONLY indication;
- TP-ONE-PHASE indication; or
- TP-EARLY-EXIT indication.

If the *dialogue is coordinated*, the current transaction shall not be in the *termination phase*.

9.2.4 TPSP constraints on TP-DATA indication

The recipient shall not have a *dialogue establishment request outstanding*.

If the Polarized Control functional unit is selected

- the recipient shall not have control of the dialogue; or
- the *dialogue shall be coordinated* and a TP-PREPARE request with the Data-Permitted parameter set to “true” shall have been issued during the current transaction.

The recipient shall not have a *handshake indication outstanding*.

The recipient shall not have a *user error request outstanding*.

The recipient shall not have a *dialogue termination indication outstanding*.

If the *dialogue is coordinated*, none of the following services shall have been issued during the current transaction:

- TP-PREPARE indication;
- TP-READY indication;
- TP-READ-ONLY indication;
- TP-ONE-PHASE indication; or
- TP-EARLY-EXIT indication.

If the *dialogue is coordinated*, the current transaction shall not be in the *termination phase*.

9.2.5 Collisions

A TP-DATA indication is not issued to a TPSUI if there is a collision of the TP-DATA request and a TP-U-ERROR request.

A TP-DATA indication is not issued for a *coordinated dialogue* after a TP-EARLY-EXIT request or a *rollback-initiating service primitive*.

A TP-DATA indication is not issued for a *coordinated dialogue* after a *transaction completion request*; either

- a TP-ROLLBACK indication is issued unless a *rollback-initiating service primitive* has already been issued for the current transaction; the Diagnostic parameter will be set to “user-data-transaction-completion-collision” if there is a *coordinated dialogue* with the Completion Diagnostics functional unit selected; or
- a TP-P-ABORT indication will be issued with the Diagnostic parameter set to “user-protocol-error” if the transaction can not be rolled back.

10 The Dialogue functional unit

10.1 Overview of the Dialogue functional unit

The Dialogue functional unit supports the basic services required to establish a dialogue between two TPSUIs within which U-ASE primitives may be invoked, signal user-initiated errors, and terminate the dialogue. The user or the provider may signal abnormal termination.

The Dialogue functional unit shall always be selected.

10.2 Dialogue Establishment service, TP-BEGIN-DIALOGUE

10.2.1 Purpose

This optionally confirmed service is used to establish a dialogue with a new TPSUI.

This service is associated with one particular dialogue.

10.2.2 Primitives and parameters

Table 5 lists the TP-BEGIN-DIALOGUE primitives and their parameters.

Table 5 — TP-BEGIN-DIALOGUE primitives and their parameters

TP-BEGIN-DIALOGUE				
parameters	req	ind	rsp	cnf
Initiating-AP-Title		O		
Initiating-API-Identifier		O		
Initiating-AE-Qualifier		O		
Initiating-AEI-Identifier		O		
Initiating-TPSU-Title	U	C(=)		
Recipient-AP-Title	M			
Recipient-API-Identifier	U			
Recipient-AE-Qualifier	U			
Recipient-AEI-Identifier	U			
Recipient-TPSU-Title	U			
Functional-Units	M	M(=)		C
Quality-of-Service	U			
Application-Context-Name	M			
Begin-Transaction	C	C(=)		
Confirmation	M	M(=)		
Result			M	M
Diagnostic				C
Rollback				M
Superior-may-send-ready	C	C(=)		
Subordinate-may-send-ready	C	C(=)		
Check-ready-directions	C	C(=)		
User-Data	U	C(=)	U	C(=)

10.2.2.1 Initiating-AP-Title, Initiating-API-Identifier, Initiating-AE-Qualifier, and Initiating-AEI-Identifier are parameters optionally provided by the TPSP. They give information about the application-entity-invocation of the TPSUI that has issued the TP-BEGIN-DIALOGUE request. These parameters are of type AP-Title, API-Identifier, AE-Qualifier, and AEI-Identifier, respectively, as defined in ISO/IEC 7498-3.

10.2.2.2 Initiating-TPSU-Title is an optional parameter which is provided by the TPSUI. It denotes the TPSU and identifies the type of TPSUI which has issued the TP-BEGIN-DIALOGUE request.

10.2.2.3 Recipient-AP-Title, Recipient-API-Identifier, Recipient-AE-Qualifier, and Recipient-AEI-Identifier are parameters which are provided by the initiating TPSUI in order to give information about the recipient application-entity-invocation at which the remote TPSUI will be located.

These parameters are of type AP-Title, API-Identifier, AE-Qualifier, and AEI-Identifier, respectively, as defined in ISO/IEC 7498-3.

10.2.2.4 Recipient-TPSU-Title is an optional parameter provided by the initiating TPSUI in order to identify the type of TPSUI with which the initiating TPSUI wants to establish a dialogue.

10.2.2.5 Functional-Units defines, in the request/indication, the functional units which may be used during the life of the dialogue. The combination of functional units specified by this parameter follows the rules according to which functional units may be combined described in clause 7.1; the Unchecked Tree functional unit is not specified in this parameter unless both the Superior-may-send-ready and the Subordinate-may-send-ready parameters are set to "true". In the confirm, Functional-Units is present if and only if the Result parameter is set to "rejected(provider)" and the Diagnostic parameter is set to "functional-unit-not-supported"; in this case, it defines the functional units that the recipient application-entity-invocation may support for a dialogue.

10.2.2.6 Quality-of-Service: this optional parameter specifies the quality of service required for the dialogue. It is of type Quality of Service as defined in ISO 8649.

NOTE Quality-of-Service parameters are currently being studied by ISO/IEC.

10.2.2.7 Application-Context-Name: this parameter specifies the application context to be used for the dialogue. It is of type Application Context Name as defined in ISO 8649.

10.2.2.8 Begin-Transaction is mandatory when the Unchained Transactions functional unit is selected and is absent otherwise. This parameter is used to specify whether a transaction branch is initiated on the dialogue. It shall take one of the following values:

- a) "false", when the subordinate TPSUI will not initially be a participant in a transaction;
- b) "true", when the subordinate TPSUI will initially be a participant in a transaction.

10.2.2.9 Confirmation is used to specify whether confirmed dialogue establishment is required. It shall take one of the following values:

- a) "always", when confirmed dialogue establishment is required;
- b) "negative", when the requestor only requires notification of rejection of the dialogue.

10.2.2.10 Result is used to specify the result of the dialogue establishment attempt. It shall take one of the following values:

- a) "accepted", when the Confirmation parameter was set to "always" and the recipient has accepted the dialogue;
- b) "rejected(provider)", when the TPSP has rejected the dialogue.
The value "rejected(provider)" is only valid on the confirm service primitive;
- c) "rejected(user)", when the recipient has rejected the dialogue.

10.2.2.11 Diagnostic is a conditional parameter which is present in the confirm if the Result parameter is set to "rejected(provider)" and is absent otherwise. It describes the type of error which caused the dialogue to be rejected. It shall take one of the following values:

- a) "recipient-unknown" when the parameters identifying the recipient application-entity-invocation do not identify a known application-entity-invocation;
- b) "recipient-tpsu-title-unknown" when the TPSP cannot find the requested TPSU-Title at the recipient;
- c) "tpsu-not-available(permanent)" when the dialogue request is recognized as being valid, but the addressed TPSU is not available due to a permanent failure. It is not worth trying again until the failure has been repaired;
- d) "tpsu-not-available(transient)" when the dialogue request is recognized as being valid, but the addressed TPSU is not available due to a transient condition. It might be worth retrying with a reasonable expectation of success;

- e) “recipient-tpsu-title-required” when the recipient application-entity-invocation requires the presence of the Recipient-TPSU-Title and this parameter was not provided in the TP-BEGIN-DIALOGUE request;
- f) “functional-unit-not-supported” when one or more of the functional units selected in the TP-BEGIN-DIALOGUE request are not supported by the recipient application-entity-invocation for the dialogue;
- g) “functional-unit-combination-not-supported” when the combination of functional units, selected in the TP-BEGIN-DIALOGUE request is not supported by the recipient application-entity-invocation for the dialogue;
- h) “subordinate shall be commit master” when the recipient application-entity-invocation does not support the Subordinate-may-send-ready parameter being set to “true”;
- i) “subordinate shall be commit slave” when the recipient application-entity-invocation does not support the Superior-may-send-ready parameter being set to “true”;
- j) “no-reason-given”.

NOTE It is recognized that, with respect to diagnostic values, work is still in progress to provide an integrated treatment across all the layers of the OSI Reference Model.

10.2.2.12 Rollback is a parameter of the confirm primitive. It shall take one of the following values:

- a) “true”, if the transaction in which the recipient is a participant is being rolled back; this value has the same usage and semantics as the TP-ROLLBACK indication. This value occurs on a TP-BEGIN-DIALOGUE confirm if the *dialogue is coordinated*, the Result parameter is set to “rejected(provider)” or “rejected(user)”, and the TP-BEGIN-DIALOGUE confirm is issued after a *transaction completion request*;

NOTE the Rollback parameter will be set to “true” after a TP-READ-ONLY request or a TP-ONE-PHASE request if the TPPM has bound data or there is bound data in the *subordinate subtree*.

- b) “false”, otherwise.

10.2.2.13 Superior-may-send-ready is mandatory when the Dynamic Commit functional unit is selected and is absent otherwise. This parameter is used to specify whether the superior will issue a ready signal or one-phase signal to the subordinate as soon as it is able. It shall take one of the following values:

- a) “false”, when the superior will not send ready;
- b) “true”, when the superior will send ready as soon as it is able.

10.2.2.14 Subordinate-may-send-ready is mandatory when the Dynamic Commit functional unit is selected and is absent otherwise. This parameter is used to specify whether the subordinate will issue a ready signal or one-phase signal to the superior as soon as it is able. It shall take one of the following values:

- a) “false”, when the subordinate will not send ready;
- b) “true”, when the subordinate will send ready as soon as it is able.

10.2.2.15 Check-ready-directions is mandatory when the Dynamic Commit and Unchecked Tree functional units are selected and the Begin-Transaction parameter is set to “true”, and is absent otherwise. It shall take one of the following values:

- a) “true”, when the TPSP shall check that the settings in the *subordinate’s subtree* of the Superior-may-send-ready and Subordinate-may-send-ready parameters can not lead to a deadlocked transaction tree;
- b) “false”, when the TPSUIs will take responsibility for ensuring that created transaction trees will be viable.

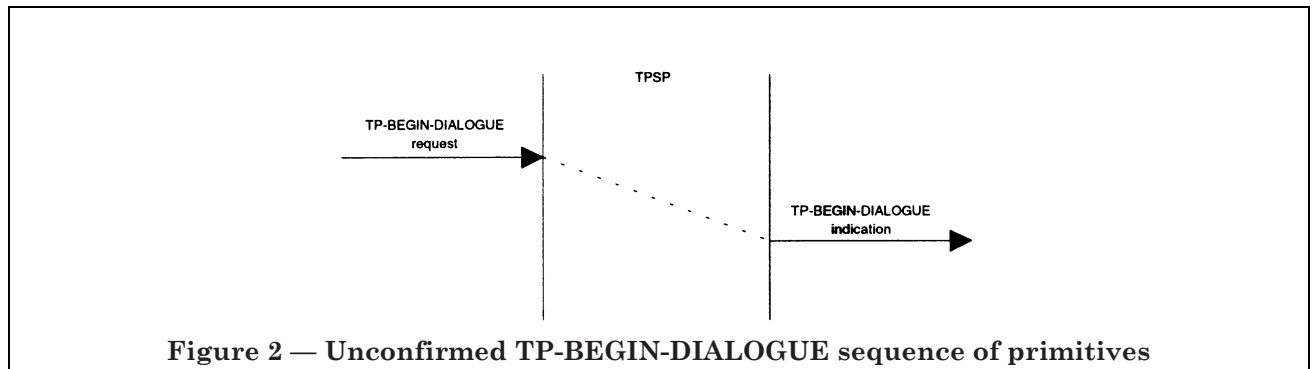
10.2.2.16 User-Data is an optional parameter that may be present in the request/indication and/or in the response/confirm. This parameter may be present in the response/confirm only if the Result parameter is set to “accepted” or “rejected(user)”.

In the request and indication, this parameter may identify user-specific semantics associated with the dialogue establishment attempt, for example, security-related information for validation, or additional information regarding the particular activity to be commenced.

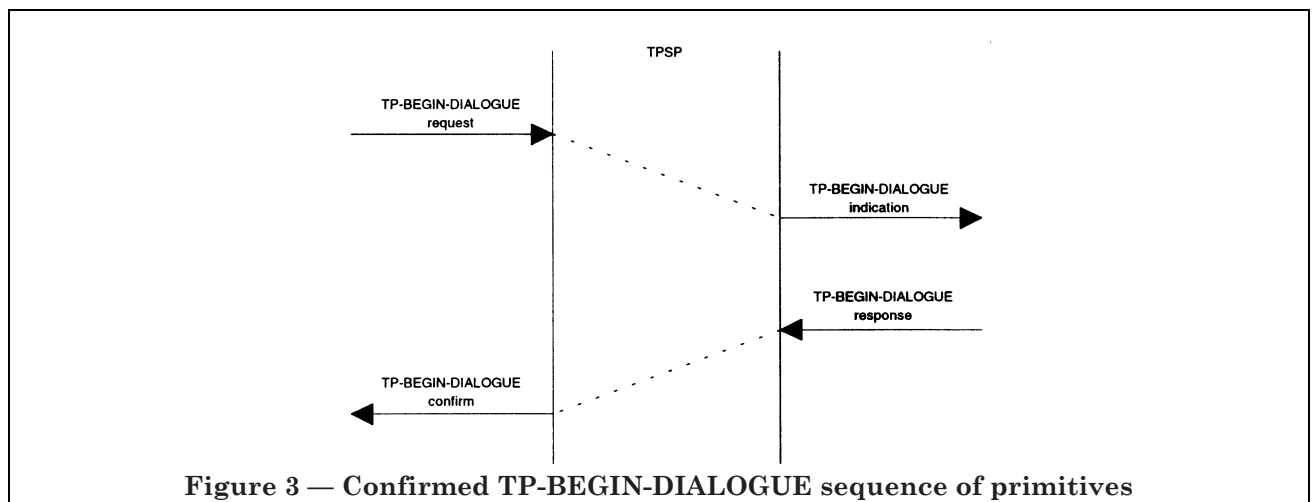
In the response and confirm, this parameter may identify user-specific semantics associated with the acceptance or rejection of the dialogue by the recipient TPSUI.

10.2.3 Sequence of primitives

The time sequence diagram of Figure 2 shows the dialogue establishment sequence of primitives when the service is not confirmed.



The time sequence diagram of Figure 3 shows the dialogue establishment sequence of primitives when the service is confirmed.



10.2.4 TPSP constraints on TP-BEGIN-DIALOGUE request

The requestor shall not have a *dialogue establishment indication outstanding* with the superior.

This service primitive shall be issued as the first service primitive for the particular dialogue and shall not be issued more than once for a particular dialogue.

If the TP-BEGIN-DIALOGUE request is used to establish a *coordinated dialogue*, the current transaction shall not be in the *termination phase*.

If the dialogue will have a coordination level of “one-phase commitment”, then there shall no superior transaction branch.

If this will be a *static one-phase exclusive branch*, then there shall not be a *two-phase expected branch*.

If this will be a *two-phase expected branch*, then there shall not be a *static one-phase exclusive branch*.

If this will be an *exclusive branch*, then there shall not be an existing *exclusive branch*.

If the Dynamic Commit functional unit is selected and the Begin-Transaction parameter is set to “true”, then if *there is tree checking*, then the Check-ready-directions parameter shall be absent or set to “true”.

10.2.5 Effects of a TP-BEGIN-DIALOGUE request

The requestor is the superior of the recipient.

The requestor has control of the dialogue.

If the Chained Transactions functional unit is selected, or if the Unchained Transactions functional unit is selected and the Begin-Transaction parameter is set to “true”, then:

- if the Commit functional unit is selected, the coordination level of the dialogue is initialized to “commitment”;

- if the One-phase Commit functional unit is selected and the Commit functional unit is not selected, the coordination level of the dialogue is initialized to “one-phase commitment”;

otherwise the coordination level of the dialogue is initialized to “none”.

If the *dialogue is coordinated*, the requestor becomes a participant in a new transaction if it is not already a participant in a transaction.

If the TPSP rejects the dialogue, it issues a TP-BEGIN-DIALOGUE confirm with the Result parameter set to “rejected(provider)” to the requestor and does not issue a TP-BEGIN-DIALOGUE indication.

10.2.6 TPSP constraints on TP-BEGIN-DIALOGUE indication

The recipient shall not have any other dialogues.

This service primitive shall be issued as the first service primitive for that particular TPSUI and shall not be issued more than once for a particular TPSUI.

10.2.7 Effects of a TP-BEGIN-DIALOGUE indication

The recipient is a subordinate of the requestor.

If the Chained Transactions functional unit is selected, or if the Unchained Transactions functional unit is selected and the Begin-Transaction parameter is set to “true”, then:

- a) if the Commit functional unit is selected, the coordination level of the dialogue is initialized to “commitment”;

- b) if the One-phase Commit functional unit is selected and the Commit functional unit is not selected, the coordination level of the dialogue is initialized to “one-phase commitment”;

otherwise the coordination level of the dialogue is initialized to “none”.

If the *dialogue is coordinated* and the Confirmation parameter is set to “negative”, the recipient becomes a participant in the same transaction as the requestor by manipulating bound data or issuing any service primitives other than a TP-BEGIN-DIALOGUE response with the Result parameter set to “rejected(user)”; otherwise if the *dialogue is coordinated* and the Confirmation parameter is set to “always”, the recipient becomes a participant in the same transaction as the requestor by issuing a TP-BEGIN-DIALOGUE response with the Result parameter set to “accepted”.

If the Polarized Control functional unit is selected, the recipient does not have control of the dialogue.

10.2.8 TPSUI conditions on TP-BEGIN-DIALOGUE response

If the *dialogue is coordinated*, the responder shall not have manipulated bound data.

10.2.9 TPSP constraints on TP-BEGIN-DIALOGUE response

A TP-BEGIN-DIALOGUE indication shall have been issued to the responder.

Bound data handled by the TPSP shall not be changed prior to the issuance of a TP-BEGIN-DIALOGUE response.

The TPSUI shall not have issued any requests or responses to any dialogues (including TP-BEGIN-DIALOGUE requests).

If the Confirmation parameter of the TP-BEGIN-DIALOGUE indication is set to “negative”, a TP-BEGIN-DIALOGUE response with the Result parameter set to “accepted” shall not be issued.

NOTE Indications may be issued for the dialogue before TP-BEGIN-DIALOGUE response (for example a TP-DATA indication).

10.2.10 Effects of a TP-BEGIN-DIALOGUE response

If the Result parameter is set to “accepted”, the dialogue is established.

If the Result parameter is set to “rejected(user)”, the dialogue is terminated.

If the *dialogue is coordinated* and the Result parameter is set to “accepted”, the recipient is a participant in the same transaction as the requestor.

NOTE If a TP-ROLLBACK indication has been issued before a TP-BEGIN-DIALOGUE response with the Result parameter set to “rejected(user)”, no TP-DONE request is owed and TP-ROLLBACK-COMPLETE indication is not issued.

10.2.11 TPSP constraints on TP-BEGIN-DIALOGUE confirm

No indications or confirms shall have been issued for the dialogue.

10.2.12 Effects of a TP-BEGIN-DIALOGUE confirm

If the Result parameter is set to “accepted”, the dialogue is established.

If the Result parameter is set to “rejected(provider)” or “rejected(user)”, the dialogue is terminated:

- a) if the value of the Rollback parameter is “true”, then the transaction is being rolled back. This value has the same usage and semantics as a TP-ROLLBACK indication; the *TPSUI owes a TP-DONE request*;
- b) if the TP-BEGIN-DIALOGUE confirm is issued with the Rollback parameter set to “false”, for the only *coordinated dialogue*, before the transaction is in the *termination phase*, there is no longer a distributed provider-supported transaction; in such a situation, the TPSUI shall either continue with the current transaction by initiating new transaction branches, or terminate the transaction through the use of a *transaction completion request* or TP-ROLLBACK request.

10.2.13 Collisions

A TP-BEGIN-DIALOGUE confirm is not issued to a TPSUI which has already terminated the dialogue by issuing a TP-U-ABORT request, or to a TPSUI which has received a TP-P-ABORT indication.

10.3 Dialogue Termination service, TP-END-DIALOGUE

10.3.1 Purpose

This optionally confirmed service is used to terminate a dialogue. Either the superior or subordinate may terminate a dialogue.

This service is associated with one particular dialogue.

10.3.2 Primitives and parameters

Table 6 lists the TP-END-DIALOGUE primitives and their parameter.

Table 6 — TP-END-DIALOGUE primitives and their parameter

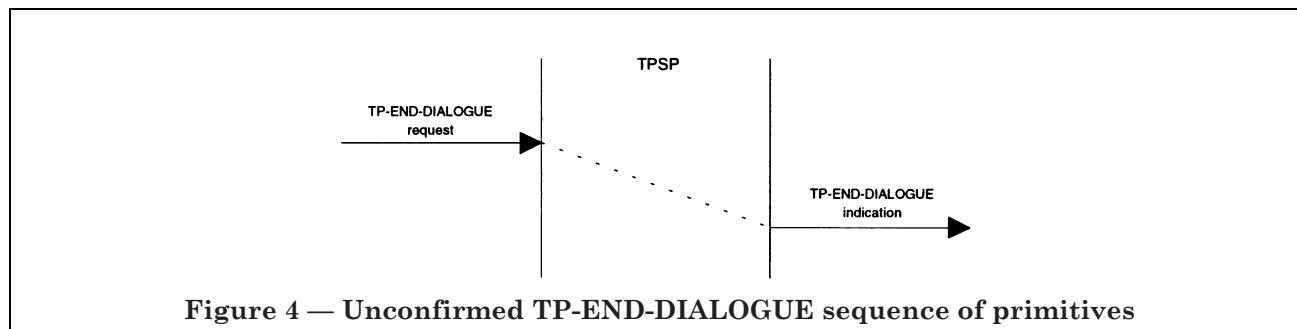
TP-END-DIALOGUE				
parameters	req	ind	rsp	cnf
Confirmation	M	M(=)		

Confirmation is a parameter that indicates whether the TP-END-DIALOGUE request will be confirmed. It shall take one of the following values:

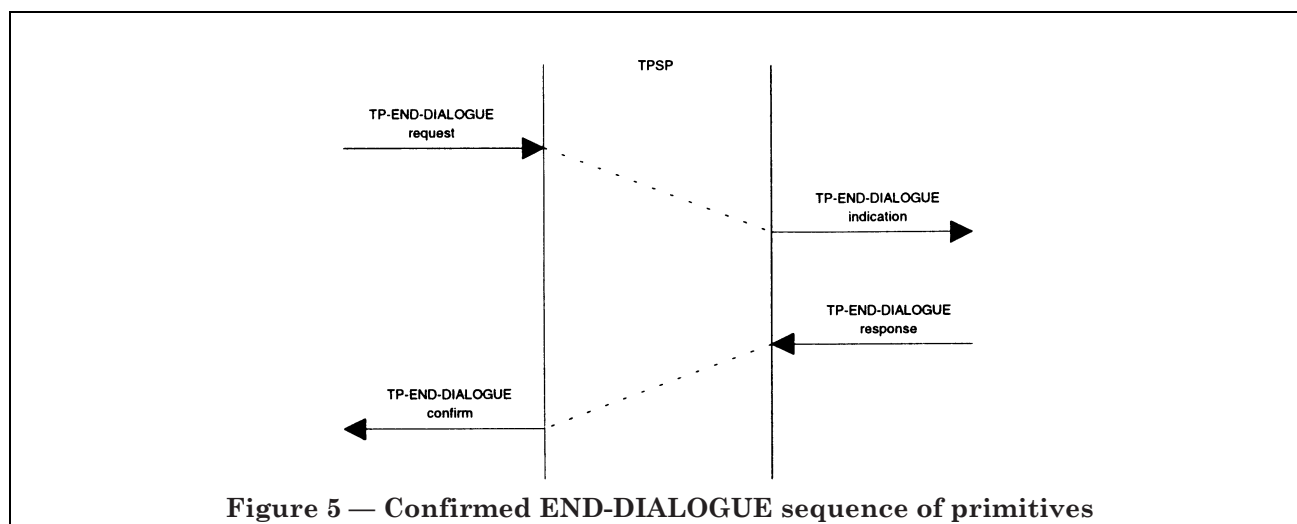
- a) “true”, when confirmation is required and dialogue termination is conditional (confirmed dialogue termination service);
- b) “false”, when dialogue termination is unconditional (unconfirmed dialogue termination service).

10.3.3 Sequence of primitives

The time sequence diagram of Figure 4 shows the dialogue termination sequence of primitives when the service is not confirmed.



The time sequence diagram of Figure 5 shows the dialogue termination sequence of primitives when the service is confirmed.



In Figure 5, TP-END-DIALOGUE response and TP-END-DIALOGUE confirm may be replaced by TP-U-ERROR request and TP-U-ERROR indication, respectively, if the dialogue termination is rejected.

10.3.4 TPSP constraints on TP-END-DIALOGUE request

The requestor shall have neither a *dialogue establishment request outstanding* nor a *dialogue establishment indication outstanding*.

The requestor shall have control of the dialogue and shall not have a *user error indication outstanding*.

The requestor shall have neither a *handshake request outstanding* nor a *handshake indication outstanding*.

The coordination level of the dialogue shall be “none”.

The requestor shall have neither a *dialogue termination request outstanding* nor a *dialogue termination indication outstanding*.

10.3.5 Effects of a TP-END-DIALOGUE request

If the Confirmation parameter is set to “false”, the dialogue is terminated.

10.3.6 TPSP constraints on TP-END-DIALOGUE indication

The recipient shall have neither a *dialogue establishment request outstanding* nor a *dialogue establishment indication outstanding*.

If the Polarized Control functional unit is selected, the recipient shall not have control of the dialogue.

The recipient shall have neither a *handshake indication outstanding* nor a *dialogue termination indication outstanding*.

The coordination level of the dialogue shall be “none”.

10.3.7 Effects of a TP-END-DIALOGUE indication

If the Confirmation parameter is set to “false”, the dialogue is terminated.

If the Confirmation parameter is set to “true” and the recipient had a *user error request outstanding*, the recipient has control of the dialogue.

10.3.8 TPSP constraints on TP-END-DIALOGUE response

The requestor shall not have a *handshake request outstanding*.

The requestor shall have a *dialogue termination indication outstanding*.

10.3.9 Effects of a TP-END-DIALOGUE response

The dialogue is terminated.

10.3.10 TPSP constraints on TP-END-DIALOGUE confirm

The recipient shall not have a *handshake indication outstanding*.

The recipient shall have a *dialogue termination request outstanding*.

10.3.11 Effects of a TP-END-DIALOGUE confirm

The dialogue is terminated.

10.3.12 Collisions

If the Shared Control functional unit is selected, a TP-END-DIALOGUE indication with the Confirmation parameter set to “true” is not issued to a TPSUI if there is a collision of the TP-END-DIALOGUE request and a TP-U-ERROR request.

A TP-END-DIALOGUE indication is not issued to a TPSUI which has issued a TP-BEGIN-TRANSACTION request; instead, a TP-P-ABORT indication with the Diagnostic parameter set to “begin-transaction-end-dialogue-collision” is issued.

A TP-END-DIALOGUE indication with the Confirmation parameter set to “true” is not issued to a TPSUI which has issued a TP-END-DIALOGUE request with the Confirmation parameter set to “true”; instead, a TP-P-ABORT indication with the Diagnostic parameter set to “end-dialogue-collision” is issued.

A TP-END-DIALOGUE confirm is not issued to a TPSUI which has already terminated the dialogue by issuing a TP-U-ABORT request, or to a TPSUI which has received a TP-P-ABORT indication.

10.4 User Error Reporting service, TP-U-ERROR**10.4.1 Purpose**

This service is used to notify a partner TPSUI of a processing error occurrence; it also serves as a negative response to the handshake service, to the handshake with grant-control service, and to the confirmed dialogue termination service.

The description of the error may be communicated by the TPSUI, using TP-DATA.

This service is associated with one particular dialogue.

10.4.2 Primitives and parameters

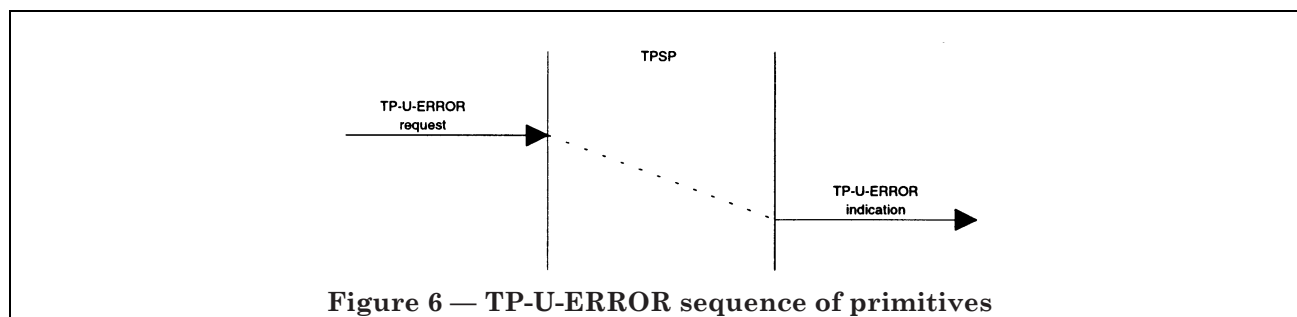
Table 7 lists the TP-U-ERROR primitives.

Table 7 — TP-U-ERROR primitives

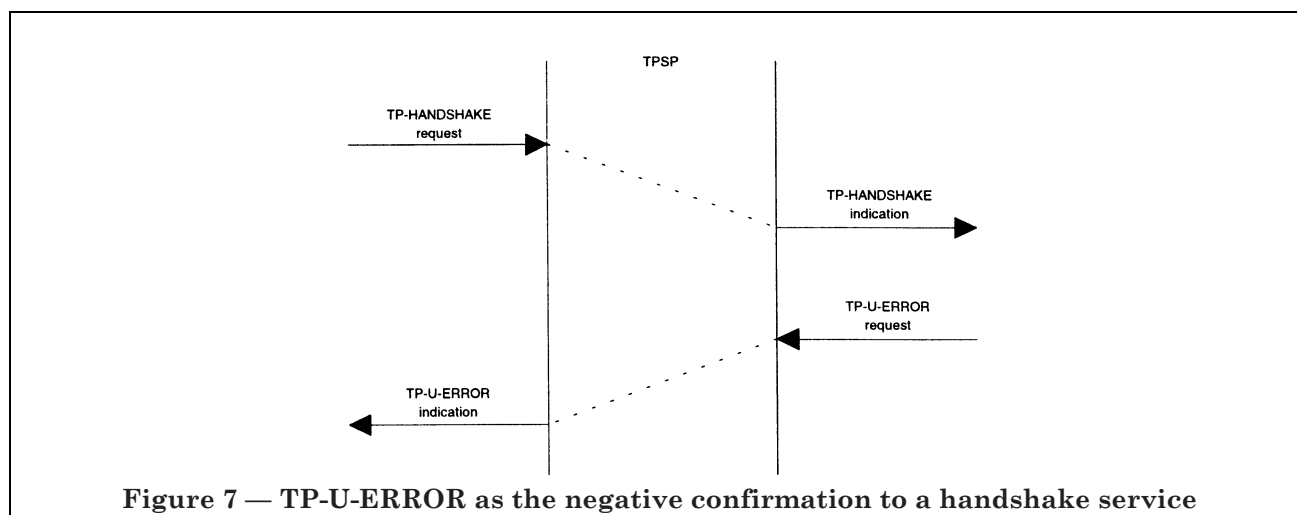
TP-U-ERROR		
no parameters	req	ind

10.4.3 Sequence of primitives

The time sequence diagram of Figure 6 shows the TP-U-ERROR sequence of primitives.



The time sequence diagram of Figure 7 shows a TP-U-ERROR request issued as a negative confirmation of a handshake service.



In Figure 7, the TP-HANDSHAKE may be replaced by a TP-END-DIALOGUE with Confirmation set to “true” or, if the Polarized Control functional unit has been selected, a TP-HANDSHAKE-AND-GRANT-CONTROL.

10.4.4 TPSUI conditions on TP-U-ERROR request

If the requestor has a *handshake indication outstanding*, synchronization was not successful.

10.4.5 TPSP constraints on TP-U-ERROR request

The requestor shall not have a *dialogue establishment indication outstanding*.

If the Polarized Control functional unit is selected, the requestor shall not have a *handshake request outstanding*.

The requestor shall not have a *dialogue termination request outstanding* unless the Shared Control functional unit is selected and the requestor has a *handshake indication outstanding*.

The requestor shall have neither a *user error request outstanding* nor a *user error indication outstanding*.

If the *dialogue is coordinated*, none of the following services shall have been issued during the current transaction:

- TP-PREPARE request;
- TP-PREPARE indication;
- TP-READY indication;
- TP-READ-ONLY indication;
- TP-ONE-PHASE indication; or
- TP-EARLY-EXIT indication.

If the *dialogue is coordinated*, the current transaction shall not be in the *termination phase*.

10.4.6 Effects of a TP-U-ERROR request

If the Polarized Control functional unit is selected, and there was a *handshake indication outstanding* or a *dialogue termination indication outstanding*, the requestor has control of the dialogue.

10.4.7 TPSP constraints on TP-U-ERROR indication

The recipient shall not have a *dialogue establishment request outstanding*.

If the Polarized Control functional unit is selected, the recipient shall have neither a *handshake indication outstanding* nor a *dialogue termination indication outstanding*.

The recipient shall have neither a *user error request outstanding* nor a *user error indication outstanding*.

If the *dialogue is coordinated*, none of the following services shall have been issued during the current transaction:

- TP-PREPARE request;
- TP-PREPARE indication;
- TP-READY indication;
- TP-READ-ONLY indication;
- TP-ONE-PHASE indication; or
- TP-EARLY-EXIT indication.

If the *dialogue is coordinated*, the current transaction shall not be in the *termination phase*.

10.4.8 Effects of a TP-U-ERROR indication

If the Polarized Control functional unit is selected and the recipient has control of the dialogue, then the recipient shall surrender control by issuing a TP-GRANT-CONTROL request.

If the Polarized Control functional unit is selected, and a *handshake request is outstanding* or a *dialogue termination request is outstanding*, the recipient does not have control of the dialogue.

10.4.9 Collisions

A TP-U-ERROR indication is not issued to a TPSUI which has issued a TP-U-ERROR request while not having control of the dialogue.

A TP-U-ERROR indication is not issued for a *coordinated dialogue* if a TP-EARLY-EXIT request or any *rollback-initiating service primitive* has been issued during the current transaction.

A TP-U-ERROR indication is not issued for a *coordinated dialogue* after a *transaction completion request* or a TP-PREPARE request has been issued; either

- a TP-ROLLBACK indication is issued unless a *rollback-initiating service primitive* has already been issued for the current transaction; the Diagnostic parameter will be set to “user-data-transaction-completion-collision” if there is a *coordinated dialogue* with the Completion Diagnostics functional unit selected;
- a TP-P-ABORT indication will be issued with the Diagnostic parameter set to “user-protocol-error” if the transaction can not be rolled back.

10.5 User Abort service, TP-U-ABORT

10.5.1 Purpose

This service is used to abort a dialogue. Use of this service may cause loss of indications and/or confirms to both TPSUIs.

This service is associated with one particular dialogue.

10.5.2 Primitives and parameters

Table 8 lists the TP-U-ABORT primitives and their parameters.

Table 8 — TP-U-ABORT primitives and their parameters

TP-U-ABORT		
parameters	req	ind
Rollback		M
User-Data	U	C(=)

10.5.2.1 Rollback is a parameter of the indication primitive. It shall take one of the following values:

- a) “true”, if the transaction in which the recipient is a participant is being rolled back; this value has the same usage and semantics as the TP-ROLLBACK indication.

This value shall occur if all of the following conditions are satisfied:

- the *dialogue is coordinated*;
- there is no *dialogue establishment indication outstanding*;
- a TP-COMMIT indication or a TP-UNKNOWN indication or a *rollback-initiating service primitive* has not been issued for the current transaction;
- there has not been a collision of a TP-BEGIN-TRANSACTION request and the TP-U-ABORT indication;
- a TP-EARLY-EXIT request or TP-READ-ONLY request has not been issued;
- a TP-EARLY-EXIT indication or TP-READ-ONLY indication has not been issued for the dialogue.

This value may also occur whenever the TPSP is in a state that requires the current transaction to be rolled back;

- b) “false”, if no rollback of a transaction occurs or if a rollback is already in progress.

This value shall occur if any of the following conditions are satisfied:

- the dialogue has a coordination level of “none”;
- the *dialogue is coordinated*, but the recipient has a *dialogue establishment indication outstanding*;
- the *dialogue is coordinated*, but a TP-EARLY-EXIT indication or a TP-READ-ONLY indication has been issued for the dialogue, or a TP-COMMIT indication or a TP-UNKNOWN indication or a *rollback-initiating service primitive* has been issued for the current transaction;

This value may also occur whenever the TPSP is in a state such that the rollback of the current transaction is not required.

NOTE The TPSP is in such a state when a TP-U-ABORT request disrupts a TP-BEGIN-TRANSACTION request or when a TP-U-ABORT request is issued by a subordinate during a rollback procedure and received by the superior after TP-ROLLBACK-COMplete indication (see ISO/IEC 10026-3 for more information).

10.5.2.2 User-Data is an optional parameter which may be used to convey user-specific semantics associated with the abort of the dialogue.

10.5.3 Sequence of primitives

The time sequence diagram of Figure 8 shows the TP-U-ABORT sequence of primitives.

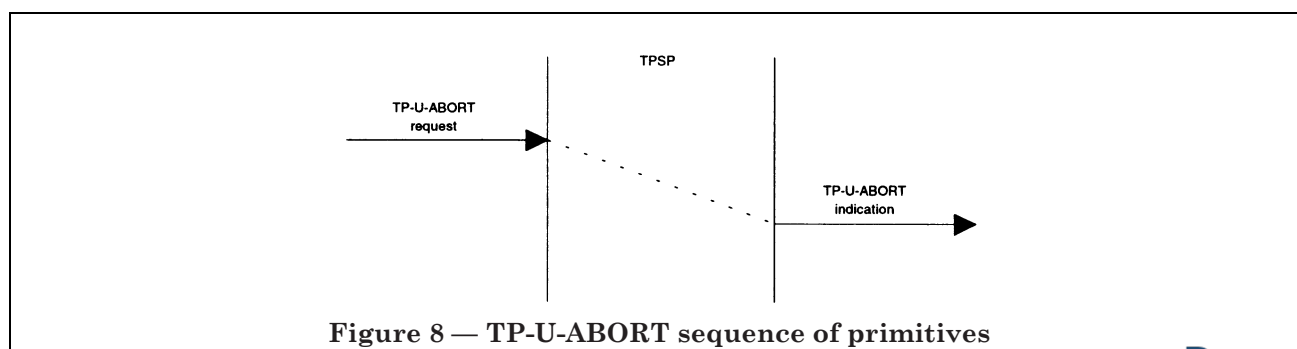


Figure 8 — TP-U-ABORT sequence of primitives

10.5.4 TPSP constraints on TP-U-ABORT request

The requestor shall not have a *dialogue establishment indication outstanding*.

For a *coordinated dialogue*, TP-U-ABORT request shall only be issued either:

- a) before the current transaction is in the *termination phase*; or
 - b) during the termination of the current transaction, after the issuance of any of the following service primitives:
 - TP-ROLLBACK request;
 - TP-ROLLBACK indication;
 - TP-EARLY-EXIT request;
 - TP-EARLY-EXIT indication;
 - TP-UNKNOWN indication;
 - TP-U-ABORT indication issued for another *coordinated dialogue*;
 - TP-P-ABORT indication issued for another *coordinated dialogue*;
 - TP-BEGIN-DIALOGUE confirm with the Result parameter set to “rejected(provider)” or “rejected(user)” for another *coordinated dialogue*;
- and prior to the issuance of the subsequent TP-DONE request.

10.5.5 Effects of a TP-U-ABORT request

The dialogue is terminated. However, if a TP-U-ABORT request is issued for a *coordinated dialogue* with a subordinate during the *termination phase of a transaction*, or after a TP-PREPARE request has been issued for the dialogue, a TP-HEURISTIC-REPORT indication may still be issued for the dialogue.

NOTE with the Implicit Prepare functional unit, heuristic decisions may be taken resulting from a prepare which is implicit in application semantics; the TPSP can not detect such prepares and thus can not warn of heuristic hazards when failures occur.

A TP-U-ABORT request, if used for a *coordinated dialogue*, causes a rollback of the current transaction unless one of the following is true:

- a TP-READ-ONLY indication or TP-EARLY-EXIT indication has been issued for the dialogue; or
- the TP-U-ABORT request is issued during the *termination phase* of the *current transaction*.

A TP-U-ABORT request, if used during the *termination phase of the transaction* for a dialogue with the Chained Transactions functional unit selected after a TP-COMMIT indication has been issued, and on which no TP-DEFERRED-END-DIALOGUE service has been issued, causes the subsequent transaction to rollback.

If the *dialogue is coordinated* and the transaction is in the *termination phase*, the TPSUI owes a TP-DONE request.

10.5.6 TPSP constraints on TP-U-ABORT indication

The recipient shall not have a *dialogue establishment request outstanding*.

If a TP-ROLLBACK indication has been issued, the recipient shall not have a *dialogue establishment indication outstanding*.

10.5.7 Effects of a TP-U-ABORT indication

The dialogue is terminated. However, if a TP-U-ABORT indication is issued for a *coordinated dialogue* with a subordinate during the *termination phase of a transaction* or after a TP-PREPARE request has been issued for the dialogue, a TP-HEURISTIC-REPORT indication may still be issued for the dialogue.

A TP-U-ABORT indication with the Rollback parameter set to “true” causes a rollback of the current transaction.

If a TP-U-ABORT indication is issued for a dialogue with the Chained Transactions functional unit selected, between a TP-COMMIT indication and the corresponding TP-COMMIT-COMplete indication, and no other *coordinated dialogues* remain after the TP-COMMIT-COMplete indication has been issued, there is no longer a provider-supported transaction; in such a situation, the TPSUI shall either continue with the (then) current transaction by initiating new transaction branches, or terminate the transaction through the use of a *transaction completion request* or TP-ROLLBACK request.

If a TP-U-ABORT indication is issued with the Rollback parameter set to “false”, for the only *coordinated dialogue*, before the *transaction is in the termination phase*, there is no longer a distributed provider-supported transaction; in such a situation, the TPSUI shall either continue with the current transaction by initiating new transaction branches, or terminate the transaction through the use of a *transaction completion request* or TP-ROLLBACK request.

If the *dialogue is coordinated* and the transaction is in the *termination phase*, the TPSUI owes a TP-DONE request.

10.5.8 Collisions

A TP-U-ABORT indication is not issued to a TPSUI which has already terminated the dialogue by issuing a TP-END-DIALOGUE request with the Confirmation parameter set to “false”, or by issuing a TP-U-ABORT request, or has received a TP-P-ABORT indication.

10.6 Provider Abort service, TP-P-ABORT

10.6.1 Purpose

This service is used by the TPSP to notify the TPSUIs of the occurrence of a failure which caused the dialogue between them to be terminated. This service may cause loss of indications and/or confirms to both TPSUIs.

This service is associated with one particular dialogue.

10.6.2 Primitives and parameters

Table 9 lists the TP-P-ABORT primitive and its parameters.

Table 9 — TP-P-ABORT indication and its parameters

TP-P-ABORT	
parameters	ind
Diagnostic	M
Rollback	M

10.6.2.1 Diagnostic is a parameter which describes the type of error which has occurred. It shall take one of the following values:

- “permanent-failure” when a permanent error condition has been encountered. It is not worth trying again until the failure has been repaired;
- “transient-failure” when a transient condition has been encountered, for example, congestion. It might be worth retrying with a reasonable expectation of success;
- “protocol-error” when a protocol error has been encountered;
- “begin-transaction-reject” when the TP-BEGIN-TRANSACTION indication is not issued because the recipient is already involved in a transaction or because of a local condition;
- “end-dialogue-collision” when two TP-END-DIALOGUE requests with the Confirmation parameter set to “true” have collided;
- “begin-transaction-end-dialogue-collision” when a TP-BEGIN-TRANSACTION request and a TP-END-DIALOGUE request have collided;
- “user-protocol-error” when user data has been received or a TP Service request has been issued by a partner TPSUI after a *transaction completion request* has been issued, and the transaction can no longer be rolled back.

NOTE such TP services could be one of TP-U-ERROR request, TP-HANDSHAKE request, TP-DEFERRED-END-DIALOGUE request. The issuance of a TP-P-ABORT indication in this case implies that a ready or equivalent signal has already been sent, as otherwise a TP-ROLLBACK indication would be issued with the Diagnostic parameter set to “user-data-transaction-completion-collision”.

NOTE it is recognized that, with respect to diagnostic values, work is still in progress to provide an integrated treatment across all the layers of the OSI Reference Model.

10.6.2.2 Rollback is a parameter of the indication primitive. It shall take one of the following values:

- a) “true”, if the transaction in which the recipient is a participant is being rolled back; this value has the same usage and semantics as the TP-ROLLBACK indication.

This value shall occur if all the following conditions are satisfied:

- the *dialogue is coordinated*;
- a *dialogue establishment indication is not outstanding*;
- a TP-COMMIT indication or a TP-UNKNOWN indication or a *rollback-initiating service primitive* has not been issued for the current transaction;
- there has not been a collision of a TP-BEGIN-TRANSACTION request and the TP-P-ABORT indication;
- a TP-EARLY-EXIT request or TP-READ-ONLY request has not been issued;
- a TP-EARLY-EXIT indication or TP-READ-ONLY indication has not been issued for the dialogue.

This value may also occur whenever the TPSP is in a state that requires the current transaction to be rolled back.

- b) “false”, if no rollback of a transaction occurs or if a rollback is already in progress. This value shall occur if any of the following conditions are satisfied:

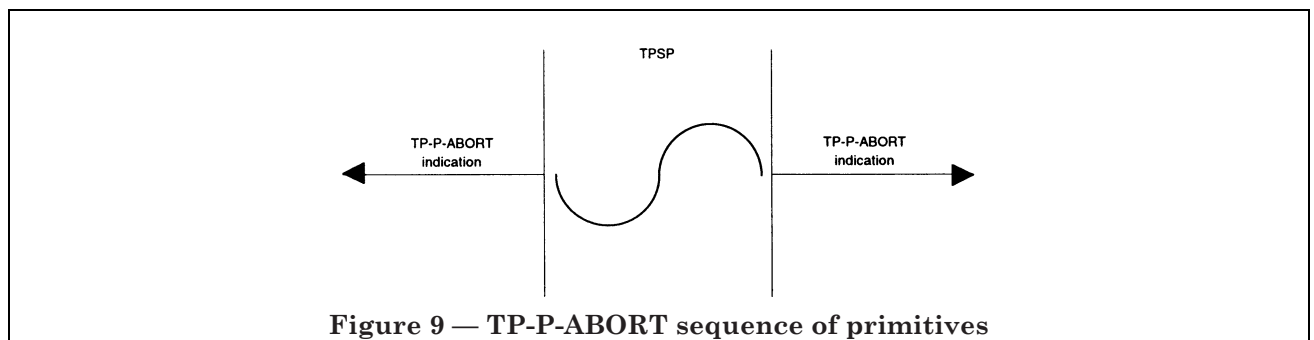
- the dialogue has a coordination level of “none”;
- the *dialogue is coordinated*, but the recipient has a *dialogue establishment indication outstanding*;
- the *dialogue is coordinated*, but a TP-EARLY-EXIT indication or a TP-READ-ONLY indication has been issued for the dialogue, or a TP-COMMIT indication or a TP-UNKNOWN indication or a *rollback-initiating service primitive* has been issued for the current transaction.

This value may also occur whenever the TPSP is in a state such that the rollback of the current transaction is not required.

NOTE The TPSP is in such a state when a TP-P-ABORT indication disrupts a TP-BEGIN-TRANSACTION (see ISO/IEC 10026-3 for more information).

10.6.3 Sequence of primitives

The time sequence diagram of Figure 9 shows the TP-P-ABORT sequence of primitives.



10.6.4 Effects of a TP-P-ABORT indication

The dialogue is terminated. However, if a TP-P-ABORT indication is issued for a *coordinated dialogue* with a subordinate during the *termination phase of a transaction* or after a TP-PREPARE request has been issued for the dialogue, a TP-HEURISTIC-REPORT indication may still be issued for the dialogue.

NOTE with the Implicit Prepare functional unit, heuristic decisions may be taken resulting from a prepare which is implicit in application semantics; the TPSP can not detect such prepares and thus can not warn of heuristic hazards when failures occur.

A TP-P-ABORT indication with the Rollback parameter set to “true” causes a rollback of the current transaction.

If a TP-P-ABORT indication is issued for a dialogue with the Chained Transactions functional unit selected, between a TP-COMMIT indication and the corresponding TP-COMMIT-COMplete indication, the TPSP will trigger a rollback of the next transaction unless the deferred end dialogue service has been issued.

If a TP-P-ABORT indication is issued with the Rollback parameter is set to “false”, for the only *coordinated dialogue*, before the transaction is in the *termination phase*, there is no longer a distributed provider-supported transaction; in such a situation, the TPSUI shall either continue with the current transaction by initiating new transaction branches, or terminate the transaction through the use of a *transaction completion request* or a TP-ROLLBACK request.

If the *dialogue is coordinated* and the transaction is in the *termination phase*, the *TPSUI owes a TP-DONE request*.

11 The Shared Control functional unit

11.1 Overview of the Shared Control functional unit

In the Shared Control functional unit both TPSUIs have control of the dialogue and so may issue request primitives subject only to the normal sequencing constraints of the primitives. For example, data may be transferred by both TPSUIs at the same time.

The Shared Control and Polarized Control functional units are mutually exclusive for a given dialogue. There are no service primitives associated with the Shared Control functional unit.

12 The Polarized Control functional unit

12.1 Overview of the Polarized Control functional unit

In the Polarized Control functional unit at most one TPSUI has control of the dialogue at any point in time. When a dialogue is established, control rests with the dialogue initiator. Subsequently, control may be passed by use of a TP-GRANT-CONTROL request or a TP-DEFERRED-GRANT-CONTROL request, and may be requested by a TP-REQUEST-CONTROL request. In addition, when a TP-U-ERROR request is issued in response to a TP-HANDSHAKE indication, or a TP-END-DIALOGUE indication with the Confirmation parameter set to “true”, or a TP-HANDSHAKE-AND-GRANT-CONTROL indication, control is passed automatically to the issuer of the TP-U-ERROR request. In the case of rollback or use of the TP-EARLY-EXIT service, at completion of the transaction, control is with the TPSUI which had it at the beginning of the transaction.

Many request primitives may be issued only by the TPSUI which has control of the dialogue. This restriction is in addition to the normal sequencing constraints for the primitives. For example, data may only be transferred by the TPSUI that has control of the dialogue or by a TPSUI that has been issued a TP-PREPARE indication with the Data-Permitted parameter set to “true”.

The Shared Control and Polarized Control functional units are mutually exclusive, for a given dialogue.

12.2 Grant Control service, TP-GRANT-CONTROL

12.2.1 Purpose

This service is used by a TPSUI to grant control of the dialogue to the partner TPSUI. This service is associated with one particular dialogue.

12.2.2 Primitives and parameters

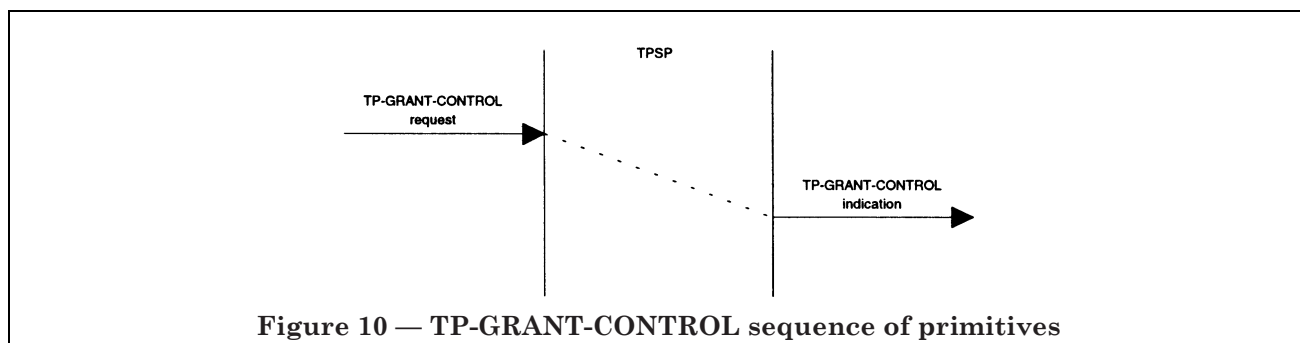
Table 10 lists the TP-GRANT-CONTROL primitives.

Table 10 — TP-GRANT-CONTROL primitives

TP-GRANT-CONTROL		
no parameters	req	ind

12.2.3 Sequence of primitives

The time sequence diagram of Figure 10 shows the TP-GRANT-CONTROL sequence of primitives.



12.2.4 TPSP constraints on TP-GRANT-CONTROL request

The Polarized Control functional unit shall be selected for the dialogue.

The requestor shall not have a *dialogue establishment indication outstanding*.

The requestor shall have control of the dialogue.

The requestor shall not have a *handshake request outstanding*.

If the *dialogue is coordinated*, a TP-PREPARE request or a TP-EARLY-EXIT indication shall not have been issued during the current transaction.

If the *dialogue is coordinated*, the current transaction shall not be in the *termination phase*.

The requestor shall not have a *dialogue termination request outstanding*.

12.2.5 Effects of a TP-GRANT-CONTROL request

The requestor no longer has control of the dialogue.

12.2.6 TPSP constraints on TP-GRANT-CONTROL indication

The Polarized Control functional unit shall be selected for the dialogue.

The recipient shall not have a *dialogue establishment request outstanding*.

The recipient shall not have control of the dialogue.

If the *dialogue is coordinated*, none of the following services shall have been issued during the current transaction:

- TP-PREPARE indication;
- TP-READY indication;
- TP-READ-ONLY indication;
- TP-ONE-PHASE indication; or
- TP-EARLY-EXIT indication.

If the *dialogue is coordinated*, the current transaction shall not be in the *termination phase*.

The recipient shall not have a *dialogue termination indication outstanding*.

12.2.7 Effects of a TP-GRANT-CONTROL indication

The recipient has control of the dialogue.

12.2.8 Collisions

A TP-GRANT-CONTROL indication is not issued for a *coordinated dialogue* if a TP-EARLY-EXIT request or any *rollback-initiating service primitive* has been issued during the current transaction.

12.3 Request Control service, TP-REQUEST-CONTROL

12.3.1 Purpose

This service is used by a TPSUI to request control of the dialogue. However, control is not actually transferred by this service and the TPSUI to which the indication is issued is not obliged to relinquish control.

This service is associated with one particular dialogue.

12.3.2 Primitives and parameters

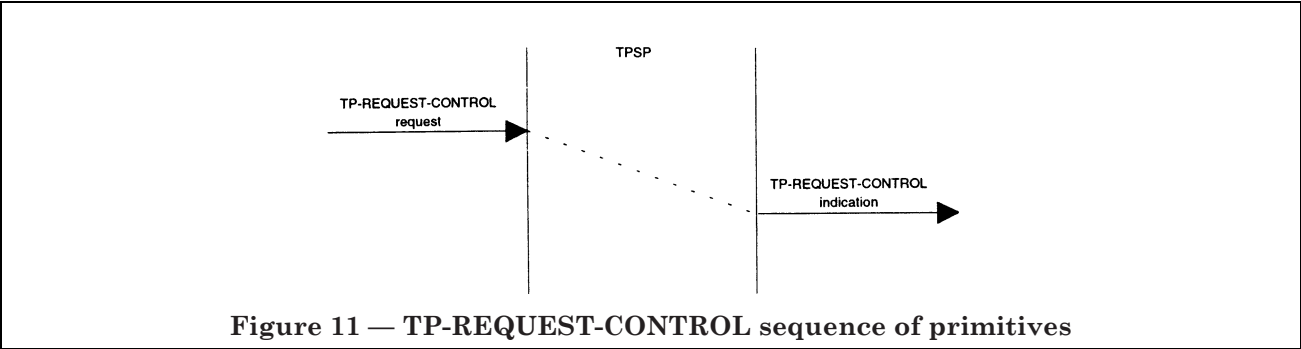
Table 11 lists the TP-REQUEST-CONTROL primitives.

Table 11 — TP-REQUEST-CONTROL primitives

TP-REQUEST-CONTROL		
no parameters	req	ind

12.3.3 Sequence of primitives

The time sequence diagram of Figure 11 shows the TP-REQUEST-CONTROL sequence of primitives.



12.3.4 TPSP constraints on TP-REQUEST-CONTROL request

The Polarized Control functional unit shall be selected for the dialogue.
The requestor shall not have a *dialogue establishment indication outstanding*.
The requestor shall not have control of the dialogue.
The requestor shall not have a TP-HANDSHAKE-AND-GRANT-CONTROL indication outstanding.
The requestor shall not have a *user error request outstanding*.
If the *dialogue is coordinated*, none of the following services shall have been issued during the current transaction:

- TP-PREPARE indication;
- TP-READY indication;
- TP-READ-ONLY indication;
- TP-ONE-PHASE indication; or
- TP-EARLY-EXIT indication.

If the *dialogue is coordinated*, the current transaction shall not be in the *termination phase*.
The requestor shall not have a *dialogue termination indication outstanding*.

12.3.5 TPSP constraints on TP-REQUEST-CONTROL indication

The Polarized Control functional unit shall be selected for the dialogue.
The recipient shall not have a *dialogue establishment request outstanding*.
The recipient shall have control of the dialogue.
The recipient shall not have a *user error indication outstanding*.
If the *dialogue is coordinated*, a TP-PREPARE request or a TP-EARLY-EXIT indication shall not have been issued during the current transaction.
If the *dialogue is coordinated*, the current transaction shall not be in the *termination phase*.
The recipient shall not have a *dialogue termination request outstanding*.

12.3.6 Collisions

A TP-REQUEST-CONTROL indication is not issued if one of the following service primitives has been issued:

- TP-GRANT-CONTROL request;
- TP-HANDSHAKE-AND-GRANT-CONTROL request; or
- TP-END-DIALOGUE request with the Confirmation parameter set to “true”.

A TP-REQUEST-CONTROL indication is not issued for a *coordinated dialogue* if one of the following service primitives has been issued:

- TP-COMMIT request;
- TP-PREPARE request;
- TP-READ-ONLY request;
- TP-EARLY-EXIT request;
- TP-ONE-PHASE request; or
- any *rollback-initiating service primitive*.

13 The Handshake functional unit

13.1 Overview of the Handshake functional unit

The Handshake functional unit allows partner TPSUIs to synchronize their processing with one another, and possibly transfer control.

13.2 Handshake service, TP-HANDSHAKE

13.2.1 Purpose

This service is used by partner TPSUIs to synchronize their processing with one another.

This service is associated with one particular dialogue.

13.2.2 Primitives and parameters

Table 12 lists the TP-HANDSHAKE primitives and their parameter.

Table 12 — TP-HANDSHAKE primitives and their parameter

TP-HANDSHAKE				
parameter	req	ind	rsp	cnf
Confirmation-Urgency	C			

Confirmation-Urgency applies only if the Shared Control functional unit has been selected. It is provided by the requestor to specify the urgency with which the confirmation is required. This parameter shall take one of the following values:

- a) “urgent” when the TPSUI requests minimal delay in receiving the confirm primitive;
 - b) “normal” when the TPSUI has no particular delay requirement in receiving the confirm primitive.
- In this case, the communication flow may be optimized by the TPSP.

13.2.3 Sequence of primitives

The time sequence diagram of Figure 12 shows the TP-HANDSHAKE sequence of primitives.

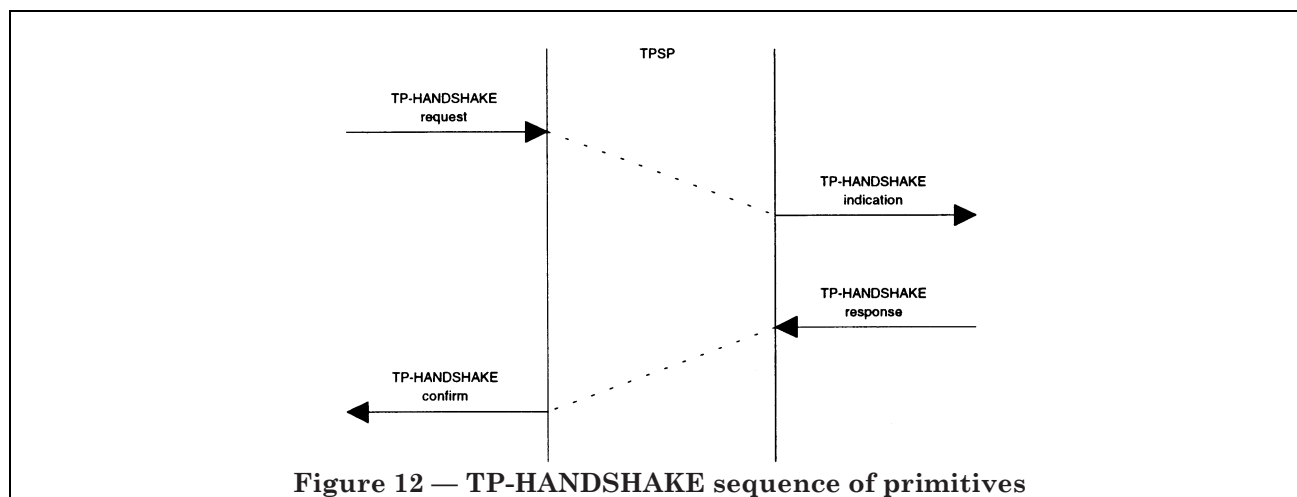


Figure 12 — TP-HANDSHAKE sequence of primitives

In Figure 12 the TP-HANDSHAKE response and the TP-HANDSHAKE confirm may be replaced by a TP-U-ERROR request and a TP-U-ERROR indication, respectively, if synchronization is unsuccessful.

13.2.4 TPSP constraints on TP-HANDSHAKE request

The Handshake functional unit shall be selected for the dialogue.

The requestor shall not have a *dialogue establishment indication outstanding*.

The requestor shall have control of the dialogue.

The requestor shall not have a *handshake request outstanding*.

The requestor shall not have a *user error indication outstanding*.

If the *dialogue is coordinated*, none of the following services shall have been issued during the current transaction:

- TP-PREPARE request;
- TP-PREPARE indication;
- TP-READY indication;
- TP-READ-ONLY indication;
- TP-ONE-PHASE indication; or
- TP-EARLY-EXIT indication.

If the *dialogue is coordinated*, the current transaction shall not be in the *termination phase*.

The requestor shall have neither a *dialogue termination request outstanding* nor a *dialogue termination indication outstanding*.

13.2.5 TPSP constraints on TP-HANDSHAKE indication

The Handshake functional unit shall be selected for the dialogue.

The recipient shall not have a *dialogue establishment request outstanding*.

If the Polarized Control functional unit is selected, the recipient shall not have control of the dialogue.

The recipient shall not have a *handshake indication outstanding*.

If the Shared Control functional unit is selected and the *dialogue is coordinated*, none of the following services shall have been issued during the current transaction:

- TP-PREPARE request;
- TP-PREPARE indication;
- TP-READY indication;
- TP-READ-ONLY indication;