

Implementation of ISO 10161-1 : 1993

**Information and
documentation – Open
Systems Interconnection –
Interlibrary Loan Application
Protocol Specification –**

Part 1. Protocol specification

UDC 025.32 : 681.3 : 621.39

National foreword

This British Standard reproduces verbatim ISO 10161-1 : 1993 and implements it as the UK national standard.

This British Standard is published under the direction of the Information and Documentation Standards Policy Committee whose Technical Committee DOT/7 has the responsibility to:

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

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INTERNATIONAL STANDARD

ISO
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Information and documentation — Open Systems Interconnection — Interlibrary Loan Application Protocol Specification —

Part 1: Protocol specification

*Information et documentation — Interconnexion de systèmes ouverts
(OSI) — Spécification du protocole d'application pour les prêts entre
bibliothèques —*

Partie 1: Spécification du protocole



Reference number
ISO 10161-1:1993(E)

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Foreword

ISO (the International Organization for Standardization) is a world-wide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 10161 was prepared by Technical Committee ISO/TC 46, *Information and documentation*.

Annexes A to D form an integral part of this International Standard. Annexes E and F are for information only.

ISO 10161 consists of the following parts, under the general title *Information and documentation — Open Systems Interconnection — Interlibrary Loan Application Protocol Specification*:

- *Part 1: Protocol specification*
- *Part 2: Protocol implementation conformance statement proforma*

Introduction

This standard is one of a set of International 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 7498). 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 managements,
- c. of different levels of complexity,
- d. of different ages.

This International Standard provides a protocol specification for Interlibrary Loan (ILL) communication. The ILL protocol operates in the Application Layer and allows the parties involved in an ILL-transaction to progress through the ILL-transaction in an orderly and defined way.

The ILL protocol has been designed to support the ILL services defined in ISO 10160, the ILL Application Service Definition.

This International Standard is one of a number of related standards supporting the interconnection of library systems. These standards can be used by themselves or in a cooperative manner to support library applications requiring a mixture of communications services. For example, ISO 10163, which supports remote access to bibliographic databases, could be used in conjunction with the ILL protocol to obtain item identification information. The control and management of interactions among such bibliographic applications are local matters that are outside the scope of this International Standard.

Security and accounting issues as they relate to ILL operations are for further study.

The specification technique used in this International Standard is consistent with techniques used in defining other OSI protocols. Within most of this document, the technique is self-explanatory. The Abstract Syntax of the ILL Application Protocol Data Units (APDUs) is defined by means of the ASN.1 specification technique specified in ISO 8824.

This International Standard contains six annexes. Annexes A to D are normative. Annex A specifies the state tables for the ILL protocol. Annex B specifies the encoding rules for generating a transfer syntax compatible with EDIFACT as defined in ISO 9735. Annex C specifies the object identifiers assigned in this standard and registration requirements.

Annex D defines the registration procedures for ILL EXTERNAL data type definitions. Annex E is an example of an ILL EXTERNAL data type definition registry entry and annex F describes the possible mappings of this protocol onto supporting services.

Information and documentation — Open Systems Interconnection — Interlibrary Loan Application Protocol Specification — Part 1: Protocol specification

1 Scope

This International Standard defines the protocol for an ILL application-service-element (ASE). It specifies the behaviour which must be exhibited by a system in order to take part in the provision of the ISO interlibrary loan service.

It provides a formal statement of the rules of behaviour of each of the two or more entities participating in an ILL transaction. It specifies:

- a. the actions to be taken on receiving request service primitives issued by an ILL service-user;
- b. the actions to be taken on receiving application-protocol-data-units (APDUs);
- c. the actions to be taken as a result of events within the local system.

It provides a specification (in clause 9) of the abstract syntax required to convey the ILL protocol APDUs.

It states the conformance requirements to be met by implementors of this protocol (in clause 10).

The scope of the ILL protocol is restricted to the interconnection of systems; it does not specify or restrict the possible implementation of interfaces within a computer system. Computer systems may range from stand-alone workstations to mainframes.

This International Standard is intended for use by libraries, information utilities such as union catalogue centres, and any other system which processes bibliographic information. These systems may participate in an interlibrary loan transaction in the role of requester (i.e. an initiator of ILL requests), responder (i.e. a provider of bibliographic material or information) and/or intermediary (i.e. an agent that acts on behalf of a requester to find suitable responders).

Various interworking topologies are supported, ranging from simple two-party interactions, to multi-party interactions.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 646:1983, *Information processing systems — ISO 7-bit coded character set for information interchange*.

ISO 2108:1978, *Documentation — International standard book numbering (ISBN)*.

ISO 2709:1981, *Documentation — Format for bibliographic information interchange on magnetic tape*.

ISO 3297:1986, *Documentation — International standard serial numbering (ISSN)*.

ISO 4217:1990, *Codes for the representation of currencies and funds*.

ISO 7498:1984, *Information processing systems — Open Systems Interconnection — Basic Reference Model*.

ISO 8459-1:1988, *Documentation — Bibliographic data element directory — Part 1: Interloan applications*.

ISO/TR 8509:1987, *Information processing systems — Open Systems Interconnection — Service conventions*.

ISO 8601:1988, *Data elements and interchange formats — Information interchange — Representation of dates and times*.

ISO 8649:1989, *Information processing systems — Open Systems Interconnection — Service definition for the Association Control Service Element*.

ISO 8650:1988, *Information processing systems — Open Systems Interconnection — Protocol specification for the Association Control Service Element*.

ISO 8822:1988, *Information processing systems — Open Systems Interconnection — Connection oriented presentation service definition*.

ISO/IEC 8824:1990, *Information technology — Open Systems Interconnection — Specification of Abstract Syntax Notation One (ASN.1)*.

ISO/IEC 8825:1990, *Information technology — Open Systems Interconnection — Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1)*.

ISO/IEC 9545:1989, *Information technology — Open Systems Interconnection — Application Layer structure*.

ISO 9735:1988, *Electronic data interchange for administration, commerce and transport (EDIFACT) — Application level syntax rules.*

ISO 9834-1:—¹⁾, *Information technology — Open Systems Interconnection — Procedures for the operation of OSI Registration Authorities — Part 1: General procedures.*

ISO/IEC 10021-4:1990, *Information technology — Text communication — Message-Oriented Text Interchange Systems (MOTIS) — Part 4: Message Transfer System: Abstract Service Definition and Procedures.*

ISO 10160:1993, *Information and documentation — Open Systems Interconnection — Inter-library Loan Application Service Definition.*

ISO 10163-1:1993, *Information and documentation — Open Systems Interconnection — Search and Retrieve Application Protocol Specification — Part 1: Protocol specification.*

1) To be published.

3 Definitions

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

3.1 Reference Model Definitions

This International Standard is based on the concepts developed in ISO 7498:1984 and makes use of the following terms found in it. These terms are replicated here as a convenience to the reader.

- 3.1.1 Application Layer:** The seventh and highest layer in the Reference Model for Open Systems Interconnection (OSI); it serves as the window between correspondent application-processes which are using the OSI to exchange meaningful information.
- 3.1.2 application-entity:** The aspects of an application-process pertinent to OSI.
- 3.1.3 application-process:** An element within a real open system which performs the information processing for a particular application.
- 3.1.4 application-protocol-data-unit:** A unit of data specified in an application-protocol and consisting of application-protocol-information and possibly application-user-data.
- 3.1.5 application-service-element:** That part of an application-entity which provides an OSI environment capability, using underlying services when appropriate.
- 3.1.6 (N)-service:** A capability of the (N)-layer and the layers beneath it, which is provided to (N+1)-entities at the boundary between the (N)-layer and the (N+1)-layer.

NOTE — An application-service does not provide a capability to higher layer entities, but rather to application-processes.

- 3.1.7 presentation-service:** A capability of the Presentation Layer and the layers beneath it, which is provided to application-entities at the boundary between the Presentation and the Application Layer.
- 3.1.8 transfer syntax:** The concrete syntax used in the transfer of data between open systems.

3.2 Abstract Syntax Notation One Definitions

This International Standard makes use of the following terms defined in ISO 8824:1990.

- 3.2.1 data type; type:** A named set of values.
- 3.2.2 simple type:** A type defined by directly specifying the set of its values.

- 3.2.3 **structured type:** A type defined by reference to one or more other types.
- 3.2.4 **component type:** One of the types referenced when defining a structured type.
- 3.2.5 **value:** A distinguished member of a set of values.

3.3 Presentation Service Definitions

This International Standard makes use of the following term defined in ISO 8822:1988.

- 3.3.1 **abstract syntax:** Those aspects of the rules used in the formal specification of data which are independent of the encoding technique to represent the data.

3.4 Application Layer Structure Definitions

This International Standard makes use of the following terms defined in ISO 9545:1989.

- 3.4.1 **application-association:** A cooperative relationship between two application-entity-invocations for the purpose of communication of information and coordination of their joint operation. This relationship is formed by the exchange of application-protocol-control-information using the Presentation Service.
- 3.4.2 **application-context:** A set of rules shared in common by two application-entity-invocations governing their behavior in order to enable their cooperative operation.

NOTE — an application-context is a shared conceptual schema for the universe of discourse for communication.
- 3.4.3 **application-context-definition:** The description of an application-context.
- 3.4.4 **application-entity-invocation:** A specific utilization of part or all of the capabilities of a given application-entity in support of the communications requirements of an application-process-invocation.
- 3.4.5 **application-process-invocation:** A specific utilization of part or all of the capabilities of a given application-process in support of a specific occasion of information processing.

3.5 Service Convention Definitions

This International Standard makes use of the following terms defined in ISO TR 8509:1987.

- 3.5.1 **indication primitive:** A representation of an interaction in which a service-provider either:

- a. indicates that it has, on its own initiative, invoked some procedure; or
- b. indicates that a procedure has been invoked by the service-user at the peer service-access-point.

3.5.2 non-confirmed service: A distinct part of the total (N)-service which does not result in an explicit confirmation from the service-provider to the initiating service-user.

3.5.3 provider-initiated service: A distinct part of the total (N)-service which is initiated by the service-provider rather than the service-user.

3.5.4 request primitive: A representation of an interaction in which a service-user invokes some procedure.

3.5.5 service primitive: An abstract, implementation-independent representation of an interaction between service-user and the service-provider.

3.5.6 service-provider: An abstract of the totality of those entities which provide a service to peer service-users.

3.5.7 service-user: An entity in a single open system that makes use of a service.

3.6 ILL Definitions

For the purpose of this International Standard, the following definitions apply to the ASN.1 value reference names and values which are associated with simple data types, as specified in clause 9. Of these definitions, the following are repetitions of those found in ISO 8459-1:1988:

author
call number
client identifier
client-status
country
edition
place-of-publication
post-office-box
postal-code
publisher
sponsoring body
street-and-number
title
transportation-mode

volume-issue

NOTE — volume-issue are defined together here, but separately in ISO 8459-1: 1988.

- 3.6.1 **account-number:** The number of an account to which a credit or debit is made. A requester typically has been assigned a separate account for each responder. (Variation of ISO 8459-1)
- 3.6.2 **additional-no-letters:** (additional-numbers-letters) A number or code identifying an item.
- 3.6.3 **already-forwarded:** Responder indication that an ILL request has already been forwarded.
- 3.6.4 **already-tried-list:** List of institutions which have been approached but were unable to supply requested item.
- 3.6.5 **answer:** A code representing a yes or no response.
- 3.6.6 **at bindery:** Title is owned but the requested item is at the bindery.
- 3.6.7 **author:** Name of the person or corporate body responsible for the intellectual or artistic content of an item, including composers, creators or originators of an item.
- 3.6.8 **author-of-article:** Author of an item which is a component part of another item.
- 3.6.9 **badly-structured-APDU:** The structure of a received APDU does not conform to the standard notation and encoding defined in ISO 8824 and 8825, or to the EDIFACT encoding defined in ISO 9735 and Annex B of this International Standard. For example, a received APDU does not match its stated length.
- 3.6.10 **being-processed-for-supply:** Item is being retrieved, copied, and/or packaged for delivery.
- 3.6.11 **call-number:** Notation assigned to an item indicating its physical location in the owner institution.
- 3.6.12 **can-send-CHECKED-IN:** An indication by the responder that it is capable of supplying the CHECKED-IN APDU.
- 3.6.13 **can-send-RECEIVED:** An indication by the requester that it is capable of supplying the RECEIVED APDU.
- 3.6.14 **can-send-RETURNED:** An indication by the requester that it is capable of supplying the RETURNED APDU.
- 3.6.15 **can-send-SHIPPED:** An indication by the responder that it is capable of supplying the SHIPPED APDU.

- 3.6.16 cannot-send-onward:** An intermediary is unable to send on a request due to communication problems.
- 3.6.17 chargeable-units:** The number of units supplied for which there is a charge.
- 3.6.18 charges:** The responder's charges for the provision of the requested service.
- 3.6.19 city:** A phrase used to identify a city, town or village. (Variation of ISO 8459-1)
- 3.6.20 client-identifier:** Number or code used to identify the client uniquely.
- 3.6.21 client-name:** Name of the person or institution for which the item has been requested. (Variation of ISO 8459-1)
- 3.6.22 client-signature-required:** Responder's stipulation that the client must sign the signature sheet enclosed with the item.
- 3.6.23 client-status:** Professional level or position of the client.
- 3.6.24 conditions:** A code used to indicate the conditions under which an item may be borrowed.
- 3.6.25 copyright-compliance:** Requester notation indicating the applicable copyright regulations or laws to which the requester is adhering.
- 3.6.26 correlation-information:** Information that is used to correlate an error report with the service request to which the report relates.
- 3.6.27 cost:** The amount asked, taken or billed by the responder for the service supplied.
- 3.6.28 cost-estimate:** Estimate of the cost to provide the service requested.
- 3.6.29 cost-exceeds-limit:** Responder indication that the minimum cost to supply the request is greater than the amount authorized.
- 3.6.30 country:** A phrase used to identify a country.
- 3.6.31 currency-code:** A code identifying the currency of an amount, according to ISO 4217-1981.
- 3.6.32 current-state:** A code identifying the state of the ILL-transaction.
- 3.6.33 date-checked-in:** The date on which a loaned item is received back by the responder.
- 3.6.34 date-due:** The date by which the loaned item should be returned to the responder. Note that this should reflect the latest date-due.
- 3.6.35 date-for-reply:** The date by which a reply should be returned to the responder.

- 3.6.36 **date-of-last-transition:** The date on which the last state transition occurred.
- 3.6.37 **date-of-most-recent-service:** The date when the most recent service event occurred at the system providing the status report. This is either a service invoked by the system providing the status report or a service reflected in a received APDU.
- 3.6.38 **date-of-service:** The date on which a service concerning an ILL-transaction is invoked.
- 3.6.39 **date-received:** The date when the item is received by the requester.
- 3.6.40 **date-requested:** The date the ILL request was initiated by the requester.
- 3.6.41 **date-returned:** The date when the item was returned to the responder.
- 3.6.42 **date-shipped:** The date when the item was shipped to the requester.
- 3.6.43 **delivery-service:** A name or code for the delivery service or method to be used in transporting the item.
- 3.6.44 **desired-due-date:** The proposed due date for the renewed loan.
- 3.6.45 **duplicate-transaction-id:** The transaction-id value of an ILL-REQUEST APDU is an illegal duplicate, i.e. the value is identical to one for an existing ILL-REQUEST received from the same requester.
- 3.6.46 **edition:** All the copies of an item produced from one master copy or substantially the same type image, having the same contents, and, in the case of non-book materials, issued by a particular publishing agency or group of such agencies.
- 3.6.47 **estimated-date-available:** Date when an item placed on hold is expected to become available.
- 3.6.48 **expiry date:** The date on which an ILL-transaction expires automatically.
- 3.6.49 **expiry flag:** An indication of whether an expiry date has been set for an ILL-transaction, and if so, whether that date is the "need-before-date", or some other date.
- 3.6.50 **extended-postal-delivery-address:** Additional information in the postal address necessary to identify the exact point of delivery, e.g. room and floor number in a large building.
- 3.6.51 **final-responder:** Institution which supplies a requested item. This term is used when it is necessary to distinguish between the responder of an ILL-transaction and the responder of an ILL-sub-transaction.
- 3.6.52 **forward flag:** An indication whether a received ILL-REQUEST has been forwarded from an intermediary.

- 3.6.53 forward note:** Note added to the ILL-REQUEST by the responder when it is forwarded to a new responder.
- 3.6.54 general-problem:** Code indicating a general problem with a received APDU detected by the ILL service-provider that is not related to either the transaction-id or permissible state transitions.
- 3.6.55 ILL-APDU-type:** Code identifying the type of APDU received.
- 3.6.56 ILL-service-type:** A code for the type of ILL service requested. These can be listed in a preferred order.
- 3.6.57 ILL-transaction:** A single complete instance of the whole ILL cycle, including all of the actions, service primitives, and messages involved from the initial ILL-Request until the cycle is concluded, as with the return of the requested material.
- 3.6.58 in-process:** Item has been received but is not yet ready for use.
- 3.6.59 in-use/on-loan:** Item is owned but is currently being used by a client or is on loan to another institution.
- 3.6.60 initial-requester:** Person or institution which initiates an ILL- transaction; this term is used when it is necessary to distinguish between the requester of an ILL-transaction and the requester of an ILL sub-transaction.
- 3.6.61 initial-requester-address:** Information identifying the telecommunications service and address by which the initial-requester can be reached.
- 3.6.62 initiator-of-most-recent service:** Identification information of the requester or responder who initiated the most recent service.
- 3.6.63 institution-symbol:** Number(s), letter(s) or a code serving to identify unambiguously and in an abbreviated format a library, institution or corporation that is participating in an ILL-transaction, e.g. institution's national union catalogue symbol.
- 3.6.64 insured-for:** Notation of the amount of insurance purchased against loss or damage of items.
- 3.6.65 intermediary-id:** Identification information of an ILL-transaction intermediary.
- 3.6.66 intermediary-problem:** Code indicating that the intermediary has a problem in processing the request.
- 3.6.67 invalid-transaction-id:** The transaction-id value of an ILL-REQUEST is invalid, e.g. the value violates the assignment rules of this International Standard, or an unknown person-or-institution symbol or person-or-institution-name is encountered.

- 3.6.68 ISBN:** The International Standard Book Number assigned to a monograph as prescribed by ISO 3297-1986.
- 3.6.69 ISSN:** The International Standard Serial Number assigned to a serial title as prescribed by ISO 2108-1978.
- 3.6.70 item-type:** A code identifying the bibliographic form in which the item has been produced.
- 3.6.71 lacking:** The title is owned but not the component part or pages requested.
- 3.6.72 lacks-copyright-compliance:** Compliance with applicable copyright regulations or laws must be indicated before copying can be done.
- 3.6.73 level-of-service:** A code that indicates the level of search detail required or the duration of time within which a response is required. Note that this code reflects regional or national conventions.
- 3.6.74 library-use-only:** Responder indication that the item may not be removed from the requesting institution.
- 3.6.75 location-address:** Information identifying the telecommunication service and address or the postal address by which the institution that owns the item can be reached.
- 3.6.76 location-id:** The symbol or name of the institution that owns the requested item.
- 3.6.77 location-note:** Additional information that supplements or corrects the bibliographic data provided in the ILL-REQUEST or that clarifies the location provided.
- 3.6.78 locations-not-found:** No potential responder has been identified.
- 3.6.79 lost:** Item declared missing and/or withdrawn from the collection.
- 3.6.80 mandatory-messaging-not-supported:** The responder does not provide the SHIPPED and/or CHECKED-IN message(s).
- 3.6.81 maximum-cost:** Maximum amount that will be paid to obtain an ILL service. (Variation of ISO 8459-1).
- 3.6.82 medium-characteristics:** Technical specifications of the physical form in which the requested item is to be supplied.
- 3.6.83 medium-type:** A code identifying the medium in which the item has been produced. (Variation of ISO 8459-1)
- 3.6.84 mistyped-APDU:** The structure of the APDU does not conform to the structure defined in this International Standard. For example, it contains a data type not defined for that version of the protocol.

- 3.6.85 monetary-value:** The value of an amount.
- 3.6.86 most-recent-service:** A code identifying the last service event occurring at the system providing the status report. This is either a service invoked by the system providing the status report or a service reflected in a received APDU. A status report sent in response to a status query will not indicate STATUS-QUERY as the most-recent-service because this would not be informative.
- 3.6.87 most-recent-service-note:** The contents of the NOTE parameter from the most recent service primitive.
- 3.6.88 name-of-institution:** A word, phrase or abbreviation which identifies a library, institution or corporation. (Variation of ISO 8459-1)
- 3.6.89 name-of-person:** A word or combination of words and/or initials by which an individual is regularly known or designated and which identifies the person participating in the ILL-transaction.
- 3.6.90 national-bibliography-no:** Information identifying the national bibliography and the corresponding record number for the desired item, e.g. Library of Congress Card Number (LCCN).
- 3.6.91 need-before-date:** The date by which the item or a reply is needed.
- 3.6.92 no-of-units-per-medium:** The number of physical pieces shipped per supplied medium.
- 3.6.93 no-reproduction:** Item may not be photocopied or mechanically reproduced in whole or in part.
- 3.6.94 non-circulating:** Item is held but is not available for loan.
- 3.6.95 not-available:** Due to some technical problem the service-user is temporarily unable to process the service request.
- 3.6.96 not-found-as-cited:** The item identification information is believed by the responder to be either incomplete or incorrect.
- 3.6.97 not-on-shelf:** Item is owned by the institution but is not charged out and is not on shelf.
- 3.6.98 not-owned:** Title is not owned by the responder.
- 3.6.99 note:** Additional information which is not covered by any other data elements.
- 3.6.100 notification note:** Note added to the FORWARD-NOTIFICATION by the responder.
- 3.6.101 on-hold:** Item has been requested by another institution or person and will be supplied to that institution or person as soon as it becomes available.

- 3.6.102 on-order:** Item has been ordered but has not been received by the responder.
- 3.6.103 on-reserve:** Item is owned but set aside for restricted use.
- 3.6.104 pagination:** The numbering of the pages of an item or a component part of an item. (Variation of ISO 8459-1)
- 3.6.105 payment-provided:** Requester statement that payment of responder charges has been authorized, is being sent, or will be enclosed with the returned material.
- 3.6.106 permission-to-chain:** An indication granting permission to the responder to initiate a chained sub-transaction with another responder.
- 3.6.107 permission-to-change-send-to-list:** An indication granting permission to the responder to alter the contents of the send-to-list. The nature of the permitted changes depends on the value of the type "preference".
- 3.6.108 permission-to-partition:** An indication granting permission to the responder to initiate a partitioned sub-transaction with another responder.
- 3.6.109 permission-to-forward:** An indication granting permission to the responder to forward the request to another responder.
- 3.6.110 person-symbol:** Number(s), letter(s) or code serving to identify unambiguously and in an abbreviated format a person who is participating in an ILL-transaction.
- 3.6.111 physical-medium:** See medium-type.
- 3.6.112 place-of-publication:** Geographical location of the publisher, or failing this, of the printer, distributor or manufacturer.
- 3.6.113 place-on-hold:** A request that a hold be placed on the item which is to be supplied as soon as it becomes available.
- 3.6.114 policy-problem:** Responder indication that there is no policy in place to permit the completion of the request.
- 3.6.115 poor-condition:** Item is owned but its physical condition prohibits lending or reproduction.
- 3.6.116 post-office-box:** A box number assigned by the post office.
- 3.6.117 postal-code:** A code which identifies a given area within a city or other geographical area.
- 3.6.118 preference:** An indication of whether the institutions listed in the send-to-list are to be approached in the order of the list or in any order.
- 3.6.119 prepayment-required:** Responder indication that prepayment is required prior to the processing of the ILL-transaction.

- 3.6.120 protocol-version-not-supported:** An APDU has been received with a protocol-version-number component identifying an unsupported version of the protocol.
- 3.6.121 protocol-version-num:** A number identifying the protocol version in use.
- 3.6.122 publication-date:** The date of issue of a work as designated by the publisher of the work.
- 3.6.123 publication-date-of-components:** The publication date assigned by the publisher to identify the unique bibliographic components of a work.
- 3.6.124 publisher:** Person(s) or organization(s) responsible for the publication of an item.
- 3.6.125 reason-locs-provided:** A code used to indicate the reason why locations are provided in response to an ILL request.
- 3.6.126 reason-no-report:** A code used to indicate the reason why no report can be provided in response to a STATUS-QUERY.
- 3.6.127 reason-not-available:** A code used to indicate the reason for item unavailability.
- 3.6.128 reason-unfilled:** A code used to indicate the reason for not filling an ILL request.
- 3.6.129 reciprocal agreement:** Requester indication of a prior agreement regarding what may be supplied and under what conditions.
- 3.6.130 region:** A phrase used to identify a province, state, region or locale.
- 3.6.131 renewable:** An indication of whether the supplied item is renewable or not.
- 3.6.132 report-source:** Code indicating whether the initiating source of the error report is the service-user or the service-provider.
- 3.6.133 report-type:** An indication of whether a report is available and if so, whether it is a status report, error report or both.
- 3.6.134 requester-id:** Identification information of the ILL-transaction requester.
- 3.6.135 requester-note:** Note provided by the ILL-transaction requester.
- 3.6.136 requester-optional-messages:** An indication of whether the requester is capable of supplying the RECEIVED and RETURNED optional messages and whether the SHIPPED and/or CHECKED-IN optional messages are required or desired from the responder.
- 3.6.137 requester-CHECKED-IN:** An indication by the requester as to whether or not it requires or desires to receive the CHECKED-IN APDU.

- 3.6.138 requester-SHIPPED:** An indication by the requester as to whether or not it requires or desires the SHIPPED APDU.
- 3.6.139 resource-limitation:** The service-user is unable to perform the requested service due to resource limitations.
- 3.6.140 responder-address:** Information identifying the telecommunications service and address by which the responder can be reached.
- 3.6.141 responder-id:** Identification information of the ILL-transaction responder.
- 3.6.142 responder-note:** Note provided by the ILL-transaction responder.
- 3.6.143 responder-optional-messages:** Indication of whether the responder is capable of sending the SHIPPED and/or CHECKED optional messages (for diagnostic purposes) and whether the RECEIVED and/or RETURNED messages are required or desired from the requester.
- 3.6.144 responder-RECEIVED:** An indication by the responder as to whether or not it requires or desires to receive the RECEIVED APDU.
- 3.6.145 responder-RETURNED:** An indication by the responder as to whether or not it requires or desires to receive the RETURNED APDU.
- 3.6.146 responder-specific-result:** A reason provided in response to an ILL request which is specific to the responder, i.e. not specified in this standard.
- 3.6.147 responder-specific-service:** A service provided by a responder which is specific to the responder, i.e. not specified in this standard.
- 3.6.148 retry-date:** The date after which a request may be retried.
- 3.6.149 retry-flag:** Requester indication that the ILL-transaction is or is not a retry of a previous one.
- 3.6.150 return-insurance-required:** Amount of insurance against loss or damage required by the responder for the return of a loaned item.
- 3.6.151 returned-via:** Requester's method of shipment used to return the item.
- 3.6.152 security-problem:** An indication that the recipient has encountered a security problem that prevents it from processing the service request. The possible reasons are outside the scope of this International Standard.
- 3.6.153 series-title-number:** Name given to a number of separate publications related to one another by the fact that each bears a collective title applying to the group or subgroup as a whole as well as its own title, and its number within that group. (Variation of ISO 8459-1)
- 3.6.154 send-to-list:** List of potential responders for forwarded, chained or partitioned ILL-transactions.

- 3.6.155 shipped-conditions:** Conditions under which an item may be used.
- 3.6.156 shipped-service-type:** A code for the type of ILL service provided.
- 3.6.157 shipped-via:** Lender's method of shipment used to send the item.
- 3.6.158 special-collections-supervision-required:** Indication by the responder that the item must be used within the special collections department or archives of the requester.
- 3.6.159 sponsoring-body:** The corporate body or organization that issued the item or that is associated with its authorship.
- 3.6.160 street-and-number:** A number and/or phrase used to identify the location of a building within a city or a rural area.
- 3.6.161 supplemental-item-description:** Additional item description information that may be represented in a machine-readable format, e.g. MARC record.
- 3.6.162 supplier-id:** Identification information of the supplier of the requested item when the supplier is different from the responder.
- 3.6.163 supply-medium-type:** A code identifying the medium in which the item is required. This can be listed in preferred order.
- 3.6.164 system-no:** A number providing system specific identification of a bibliographic record for a requested item.
- 3.6.165 telecom-service-address:** Unique number or code assigned to an electronic mailbox or service or to a participant in a communications network.
- 3.6.166 telecom-service-identifier:** Unique name or code of the telecommunication service used for the ILL-transaction.
- 3.6.167 time-of-service:** Time at which a service is invoked.
- 3.6.168 title:** Name of an item consisting of a word or group of words intended to identify it.
- 3.6.169 title-of-article:** Title of an item which is a component part of another item.
- 3.6.170 transaction-group-qualifier:** An alphanumeric string uniquely identifying a set of related ILL-transactions, e.g. a series of referrals or an ILL request and its subsequent retry. This qualifier is unique within the scope of the original ILL-transaction requester's system. In combination with the requester's id, this provides a universally unique identifier for the ILL-transaction group.
- 3.6.171 transaction-id-problem:** Code indicating a problem with the transaction-id in a received APDU.
- 3.6.172 transaction-qualifier:** An alphanumeric string identifying all services and messages associated with a single ILL-transaction. Note that this is a unique

string assigned by the initial requester of the ILL-transaction and applied by the ILL partners to all subsequent services and messages associated with the ILL-transaction. In combination with the requester's id and the transaction-group-qualifier this provides a universally unique identification for the ILL-transaction.

- 3.6.173 transaction-type:** A code that identifies the type of ILL-transaction.
- 3.6.174 transportation-mode:** Means of transporting the item.
- 3.6.175 unable-to-perform:** Code indicating the reason why the service-user is unable to perform the requested service.
- 3.6.176 unknown-transaction-id:** There is no ILL-transaction corresponding to the transaction-id value of a received APDU.
- 3.6.177 unrecognized-APDU:** The type of the received APDU is not one of the APDUs defined in this International Standard.
- 3.6.178 verification-reference-source:** An authoritative source of bibliographic information used to identify or locate an item / any source used to identify or locate an item. (Variation of ISO 8459-1).
- 3.6.179 volume-issue:** Identifier of a physical unit of a serial or multi-volume monograph / number, letter or word identifying a unit of an item which is, or the volumes which are, published in parts.
- 3.6.180 volume/issue-not-yet-available:** Title is owned but the requested component part has not yet been received.
- 3.6.181 will-pay-fee:** Requester notation indicating that the requester agrees to pay the applicable fee.
- 3.6.182 will-supply-results:** Code for identifying additional information associated with the "will-supply" result in the response to an ILL request.

4 Abbreviations

ACSE	- association control service element
APDU	- application-protocol-data-unit
ASE	- application-service-element
ASN.1	- abstract syntax notation one
EDIFACT	- Electronic Data Interchange For Administration, Commerce and Trade
ILL	- interlibrary loan
ILLPM	- ILL protocol machine
MHS	- Message Handling System
MOTIS	- Message Oriented Text Interchange System
MTS	- Message Transfer System
OSI	- open systems interconnection

5 Overview of the Protocol

5.1 Service Provision

The protocol specified in this International Standard provides the services defined in ISO 10160. These services are listed in Table 1.

Table 1 – ILL Services

SERVICE	TYPE
ILL-REQUEST	non-confirmed
FORWARD	non-confirmed
FORWARD-NOTIFICATION	provider-initiated
SHIPPED	non-confirmed
ILL-ANSWER	non-confirmed
CONDITIONAL-REPLY	non-confirmed
CANCEL	non-confirmed
CANCEL-REPLY	non-confirmed
RECEIVED	non-confirmed
RECALL	non-confirmed
RETURNED	non-confirmed
CHECKED-IN	non-confirmed
OVERDUE	non-confirmed
RENEW	non-confirmed
RENEW-ANSWER	non-confirmed
LOST	non-confirmed
DAMAGED	non-confirmed
MESSAGE	non-confirmed
STATUS-QUERY	non-confirmed
STATUS-OR-ERROR-REPORT	non-confirmed
EXPIRY	provider-initiated

5.2 Supporting Services Assumed

The ILL protocol is specified to potentially operate in both store-and-forward and connection-oriented modes. The specification of mappings to specific supporting services are to be provided in application-context-definitions and functional-profiles. Annex F describes some possible mappings to supporting services.

5.3 Model

In the abstract, the operation of the ILL protocol is modelled by the interaction of ILL protocol machines (ILLPM). The ILLPMs communicate by exchanging ILL APDUs through the use of the abstract services "send APDU" and "receive APDU" at their lower boundary. At their upper boundary, the ILLPMs provide the services defined in ISO 10160.

An ILLPM is driven by the receipt of input events from its ILL service-user, supporting service provider or from an internal timer. The input events from the ILL service-user are request primitives and from the ILL supporting service they are received APDUs. The input event from the internal timer is timer expiry.

An ILLPM responds to input events by issuing output events to its supporting service and to its ILL service-user. The output events to the supporting service are the sending of ILL APDUs. The output events to its ILL service-user are ILL indication primitives.

The receipt of an input event, the generation of dependent actions, and the resultant output event are considered to be an indivisible action.

Logically there is a separate invocation of a set of ILLPMs for each ILL-transaction. Those invocations maintain the state information for a given ILL-transaction. The lifetime of an ILLPM invocation is as long as is required to complete the associated ILL transaction. This state information must be preserved across all instances of use of supporting services, for example, it must be maintained separate from any state information associated with underlying application-associations. Many ILL-transactions, and hence many ILLPMs, may be in existence simultaneously.

The ILL protocol machine expects that its APDUs will be transferred reliably without loss, alteration or addition of any information. It is tolerant to repeated APDUs. The protocol allows for user-initiated repetition of service requests to recover from lost, out-of-sequence or malformed APDUs. The mechanisms whereby such problems are detected and users are notified are outside the scope of this specification.

6 ILL APDUs

An ILL APDU is a unit of information which passes between two peer ILL ASEs involved in an ILL-transaction. This clause lists the APDUs used in the ILL application and describes the use and meaning of these APDUs.

ILL-REQUEST	used by the requester to request the loan, the location, or a photocopy of an item, or a cost estimate for a service from a library.
FORWARD-NOTIFICATION	used by the service provider to inform the requester that its request has been forwarded, and to whom.
SHIPPED	used by the responder to indicate that an item has been shipped.
ILL-ANSWER	used by the responder to send a response to the requester (possible responses are: CONDITIONAL, RETRY, UNFILLED, LOCATIONS-PROVIDED, WILL-SUPPLY, HOLD PLACED and ESTIMATE).
CONDITIONAL-REPLY	used by the requester to reply to an ILL-ANSWER with a status of CONDITIONAL. Possible answers are YES (we will meet the conditions) and NO (we do not agree to meet the conditions).
CANCEL	used by the requester to initiate cancellation of an ILL-transaction.
CANCEL-REPLY	used by the responder to respond to a CANCEL request.
RECEIVED	used by the requester to indicate that an item has been received.
RECALL	used by the responder to request the immediate return of an item.
RETURNED	used by the requester to indicate that a borrowed item has been returned.

CHECKED-IN	used by the responder to acknowledge the return of a borrowed item.
OVERDUE	used by the responder to notify the requester that an item is overdue.
RENEW	used by the requester to request the renewal of a borrowed item.
RENEW-ANSWER	used by the responder to respond to a RENEW request.
LOST	used by either the requester or the responder to notify the other that an item has been lost.
DAMAGED	used by either the requester or the responder to notify the other that an item has been damaged.
MESSAGE	used by either the requester or the responder to communicate with the other without affecting the state of the ILL-transaction.
STATUS-QUERY	used by either the requester or the responder to request the status of the ILL-transaction at the remote site.
STATUS-OR-ERROR-REPORT	used by either the requester or the responder to report the current state of a ILL-transaction, and any other relevant information available, or to report an error condition.
EXPIRED	used by the responder system to notify the requester of ILL-transaction expiry. The sending of this APDU is initiated by the ILL service-provider and not by the service-user.

7 Transaction Information

An ILL system must maintain the following information for each ILL-transaction:

- transaction identification
- protocol state
- protocol variables
- expiry timer
- request information
- history information

7.1 Transaction Identification

An ILL APDU or service primitive is associated with an ILL-transaction by means of a transaction-id.

The transaction-id satisfies the following requirements:

- a. uniqueness in the case of chaining and partitioning;
- b. allows sub-transactions to be related to the parent ILL-transaction;
- c. allows multiple ILL-transactions to be related together into a logical grouping, e.g. when a requester refers an ILL request to many responders in turn; or a retry is to be related to the original ILL request.

It consists of the following components:

initial-requester-id (optional):	identifies the ILL-transaction initiator;
transaction-group-qualifier (mandatory):	distinguishes a group of ILL-transactions from all other active ILL-transaction groups associated with the initial-requester;
transaction-qualifier (mandatory):	distinguishes an ILL-transaction from all other ILL-transactions within an ILL-transaction group;
sub-transaction-qualifier (optional):	distinguishes a sub-transaction from all other sub-transactions initiated by the intermediary.

Figure 1 summarizes the use of the components of transaction-id.

Simple Transaction

Initial-requester-id	Transaction-group qualifier	Transaction qualifier	Sub-transaction qualifier
optional	mandatory	mandatory	not used
set by requester	set by requester	set by requester	

Chained or Partioned Transaction

Initial-requester-id	Transaction-group qualifier	Transaction qualifier	Sub-transaction qualifier
mandatory	mandatory	mandatory	mandatory
set by intermediary	set by requester	set by requester	set by intermediary

Figure 1 — Components of Transaction-id

The initial-requester-id identifies the initiator of the ILL-transaction. It may take on any of the possible representations identified in clause 7.5.1 for system-id, but if the person-or-institution-symbol representation is used, then the ILL-transaction is constrained to occur only within a domain where that symbol is unambiguous, e.g. within a country. When this component is assigned a value by the intermediary, the value is the same as "requester-id" type in the original ILL-REQUEST.

NOTE — The internal components of initial-requester-id may need to be further defined within an application profile definition.

For a simple two-party ILL-transaction, the initial-requester-id component need not be included as part of the transaction-id because this information is available already in the requester-id type of the ILL-REQUEST APDU. Also, the sub-transaction-qualifier is not needed.

The transaction-group-qualifier is a mandatory component of the transaction-id. It is unique within the scope of the initial-requester. The initial-requester is responsible for assigning values to this qualifier to satisfy this rule. A transaction-group-qualifier can be reused only when there are no ILL-transactions active within that group and there is little probability that new related transactions will be initiated. The transaction-group-qualifier can be used to relate multiple ILL-transactions, e.g. in the case of referrals or in the case of retries where it is desired to distinguish the retries from the original ILL-transaction.

The transaction-qualifier uniquely identifies an ILL-transaction within a transaction group. It is a mandatory component of a transaction-id.

For a sub-transaction, all components are needed. The initial-requester-id together with the transaction-group-qualifier and the transaction-qualifier ensure that the ILL-transaction is unique within the domain of uniqueness of the initial-requester-id. The sub-transaction-qualifier together with the requester-id information conveyed in a sub-transaction ILL-REQUEST APDU ensure sub-transaction uniqueness.

In the case of chained ILL-transactions, there may be a sequence of sub-transactions linked in a chain. In such cases, each sub-transaction is considered to be a sub-transaction of the original ILL-transaction, so each intermediary which initiates a new sub-transaction replaces the current sub-transaction-qualifier with a new one which is unique within the scope of the intermediary. All sub-transactions of a particular ILL-transaction can be distinguished on the basis of the combination of the transaction-id and the requester-id.

7.2 Protocol States

The ILL protocol states are identical to the ILL-transaction states defined in the ILL Service Definition.

7.2.1 Requester States

The requester state is the state of processing of an ILL-transaction at the requester. It may be one of the following:

IDLE

- The ILL-transaction has not started.

PENDING

- A request has been made and the item is expected from the responder; or a message has been received indicating that the item will be supplied or has been placed on hold; or that the request has been forwarded to another institution.

NOT-SUPPLIED

- The ILL-transaction has reached a stage where the request cannot be filled by the responder.

CONDITIONAL

- The ILL-transaction has reached a stage where the request can only be filled if the requester agrees to meet specified conditions.

CANCEL PENDING

- The requester has initiated cancellation of the ILL-transaction but no response has been received from the responder.

CANCELLED

- The ILL-transaction has been cancelled by the responder.

SHIPPED

- The item has been shipped to the requester.

RECEIVED

- The item has been received from the responder.

RENEW/PENDING

- A request has been made for the renewal of the item.

RENEW/OVERDUE

- A request has been made for the renewal of an item which is overdue.

OVERDUE

- The requester has been notified that the item is overdue.

NOT RECEIVED/OVERDUE

- The responder has sent an overdue notification for an item that has not yet been received.

RECALL

- The item has been recalled by the responder.

RETURNED

- The item has been shipped back to the responder.

LOST

- The item has been lost.

7.2.2 Responder States

The responder state is the state of processing of an ILL-transaction at the responder. It may be one of the following:

IDLE

- The responder has not received a request.

IN-PROCESS

- A request has been received and is being processed by the responder; the item has not been shipped.

FORWARD

- The request has been forwarded to another institution.

NOT-SUPPLIED

- The responder has responded to a request with an ILL-ANSWER of RETRY, UNFILLED, LOCATIONS-PROVIDED or ESTIMATE; or the ILL-transaction has expired.

CONDITIONAL

- The request can only be filled if the requester agrees to meet specified conditions.

CANCEL-PENDING

- The requester has initiated cancellation of the ILL-transaction but no response has been provided by the responder.

CANCELLED

- The ILL-transaction has been cancelled by the responder.

SHIPPED

- The item has been shipped to the requester.

RENEW/PENDING

- A request has been made for the renewal of the item.

RENEW/OVERDUE

- A request has been made for the renewal of an item which is overdue.

OVERDUE

- The responder has informed the requester that the item is overdue.

RECALL

- The item has been recalled by the responder.

CHECKED-IN

- The item has been received back from the requester.

LOST

- The item has been lost.

7.2.3 Terminal States

For the requester, responder and intermediary, there are certain states, known as terminal states which, when reached, will not result in any further transitions for a given ILL-transaction. The only exception is a transition to another terminal state.

An ILL-transaction would normally be maintained in a terminal state for a certain length of time before the ILL-transaction information is made inaccessible to the peer or is deleted. This length of time is a local management decision, or subject to agreement by implementors. Note, however, that the requirement to respond to a Status-Query request, and the requirement to relay messages suggests that this length of time may have to be sufficient to allow the information to be accessible for the maximum loan period plus renewal periods and delivery time. For non-returnable items, the length of time may have to be sufficient to allow the requester to determine that an expected item will not be received and to invoke the Status-Query or Lost services.

The possible terminal states for the requester are:

- NOT-SUPPLIED
- CANCELLED
- RECEIVED (if a non-returnable item is received)
- RETURNED
- LOST

The possible terminal states for the responder are:

- NOT-SUPPLIED
- CANCELLED
- FORWARD

- SHIPPED (if a non-returnable item is shipped)
- CHECKED-IN
- LOST

The terminal state for a particular ILL-transaction will depend on its circumstances. For example, when a photocopy is provided, SHIPPED is the terminal state for the responder, while RECEIVED is the terminal state for the requester.

The possible terminal states for the intermediary are:

- NOT SUPPLIED
- FORWARD
- CANCELLED
- SHIPPED

7.2.4 Intermediary States

An intermediary involved in a chained or partitioned ILL-transaction plays both the role of responder (in its interactions with the requester) and requester (in its interactions with the responder). It maintains separate state information for each of these sets of interactions.

For unsuccessful sub-transactions, the terminal states for the intermediary requester are NOT-SUPPLIED and CANCELLED; for the intermediary responder, they are NOT-SUPPLIED, CANCELLED and FORWARD.

For a successful ILL-transaction, the terminal state for an intermediary in both the roles of requester and responder is the SHIPPED state.

7.3 Protocol Variables

The following protocol variables affect ILL protocol behaviour. These variables are maintained by the ILLPM and are set according to parameters of service primitives or received APDUs. An intermediary maintains the appropriate protocol variables separately for its requester and responder roles.

RETURN:	used to indicate whether a shipped item is required to be returned to the responder. It takes on the values TRUE or FALSE.
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FWD:	used to indicate whether or not a request may be forwarded by the responder. It takes on the values TRUE or FALSE.
PART:	used to indicate whether an ILL-transaction can be partitioned. It takes on the values TRUE or FALSE.
CHAIN:	used to indicate whether an ILL-transaction can be chained. It takes on the values TRUE or FALSE.
SEQUENCE-TIME-STAMP:	used to preserve the time stamp of the last received APDU. This variable is set to the value of the type "date-time-of-this-service" in the received APDU, and serves to detect out-of-sequence APDUs.
REPEAT-TIME-STAMP:	used to preserve the time stamp of the last received APDU which caused a state change. This variable is set to the value of the type "date-time-of-this-service", or if the received APDU is itself a repeated one, then this protocol variable is set to the value of the type "date-time-of-original-service".
CURRENT-PARTNER-ID:	used to preserve the identification of the current partner for the ILL-transaction for the purpose of APDU sequence validation. For the requester, it is set initially to the value of the parameter "responder identification" in an ILL-REQUEST service primitive. Thereafter it is updated to the value of "responder identification" in a received APDU when that value is not equal to the value of CURRENT-PARTNER-ID and is not one of the values of PREVIOUS-PARTNER-IDS. Similarly, for the responder, it is set initially to the value of the field "requester-id" in a received ILL-REQUEST and is updated to the value of the same field in subsequent APDUs.
PREVIOUS-PARTNER-IDS:	used to preserve the identification of previous partners for the ILL-transaction. Whenever the value of CURRENT-PARTNER-ID is changed, the previous value is added to this protocol variable. Since the

current partner identification may change more than once in the course of an ILL-transaction, e.g. as a result of multiple instances of forwarding, this protocol variable may consist of a sequence of values.

7.4 Expiry Timer

The following timer must be maintained by the responder:

EXPIRY: specifies the date of ILL-transaction expiry.

This information is provided by the requester in the ILL-REQUEST.

7.5 Request Information

The entire contents of the original ILL-REQUEST must be preserved to support ILL-transaction forwarding, partitioning and chaining. An intermediary may however change the contents of an ILL-REQUEST when the request is forwarded or a sub-transaction is initiated. For example, it may correct bibliographic information provided, or it may change the permission-to-chain to FALSE in a sub-transaction when the value in the original ILL-REQUEST was TRUE.

An intermediary should always change the value of requester-id to its own when a sub-transaction is initiated. Note that the identity of the initial requester is preserved in the transaction-id.

7.5.1 System-id

The ILL-REQUEST information includes the identification of the requester and responder, both of which are of type system-id, which consists of one or more of the following components:

person-or-institution-symbol:	Number(s), letter(s) or a code serving to identify unambiguously to the responder, in an abbreviated format a person or institution which is participating in an ILL request.
name-of-person-or-institution:	a word, phrase or abbreviation which identifies a person, library, institution or corporation.

A person-or-institution-symbol may have internal structure, e.g. to indicate an institution's affiliation with a particular utility, consortium, etc., or to identify individual workstations (i.e. application processes) within an institution. Any such structure is outside the scope of this standard and is the responsibility of the appropriate authorities.

Since the scope of a person-or-institution-symbol is limited, ILL-transactions which use only this information as part of system-id are constrained to operate only within the domain of the symbol. ILL-transactions which involve persons or institutions outside that domain must include "name-of-person-or-institution" as part of the system-id.

The name-of-person-or-institution represents a free-form description of a person or institution title.

The requester must use the same value for System-id throughout an ILL-transaction. The same applies to the other parties involved in the transaction.

7.6 History Information

The following additional history information is provided as part of a STATUS-OR-ERROR-REPORT for an ongoing ILL-transaction and, therefore, must be maintained throughout the lifetime of an ILL-transaction:

- date-of-last-transition
- most-recent-service
- date-of-most-recent-service
- initiator-of-most-recent-service
- shipped-service-type
- transaction-results
- most-recent-service-note

The "most-recent-service" indicates which ILL service primitive was last invoked or which APDU (indication) last received by this ILL service-user. An exception is when a STATUS-OR-ERROR-REPORT is sent in response to a STATUS-QUERY, in which case the "most-recent-service" is the one prior to the STATUS-QUERY.

The "date-of-most-recent-service" indicates the date of the "most-recent-service".

The "initiator-of-most-recent-service" identifies the requester or responder who initiated the most recent service.

The "shipped-service-type" and "transaction-results" information may not be available for all ILL-transactions.

The "most-recent-service-note" provides the contents of the Note parameter from the most recent service primitive.

If status information is requested for a terminated ILL-transaction, no history information may be available.

8 Elements of Procedure

8.1 Events and Actions

This clause describes the allowable events and actions for a single ILL-transaction. The requester, responder and intermediary must react to various events by taking specific actions. An event is defined to be the receipt of an APDU from another ILL ASE or the receipt of a service primitive from the local ILL service user. An action can take the form of the issuance of a service primitive to the local ILL service user, or the transmission of one or more APDUs to a remote ILL ASE.

The following subclauses identify which events and actions are allowable for the requester, responder and intermediary and which, by implication, are not.

8.1.1 Requester Events

This clause describes the allowable events for a requester.

The events relating to service primitive requests from the ILL service user are:

- ILL-REQUEST.request
- CONDITIONAL-REPLY.request : answer = YES
- CONDITIONAL-REPLY.request : answer = NO
- CANCEL.request
- RECEIVED.request
- RETURNED.request
- RENEW.request
- LOST.request
- DAMAGED.request
- MESSAGE.request
- STATUS-QUERY.request
- STATUS-OR-ERROR-REPORT.request

The events relating to ILL APDUs received from the remote ILL ASE are the following:

FORWARD-NOTIFICATION

SHIPPED

ILL-ANSWER : Request-result = CONDITIONAL

ILL-ANSWER : Request-result = RETRY

ILL-ANSWER : Request-result = UNFILLED

ILL-ANSWER : Request-result = LOCATIONS-PROVIDED

ILL-ANSWER : Request-result = WILL-SUPPLY

ILL-ANSWER : Request-result = HOLD-PLACED

ILL-ANSWER : Request-result = ESTIMATE

CANCEL-REPLY

RECALL

CHECKED-IN

OVERDUE

RENEW-ANSWER : answer = YES

RENEW-ANSWER : answer = NO

LOST

DAMAGED

MESSAGE

STATUS-QUERY

STATUS-OR-ERROR-REPORT

EXPIRED

8.1.2 Requester Actions

The following service primitives can be issued to the ILL service user:

FORWARD-NOTIFICATION.indication
 SHIPPED.indication
 ILL-ANSWER.indication : Request-result = CONDITIONAL
 ILL-ANSWER.indication : Request-result = RETRY
 ILL-ANSWER.indication : Request-result = UNFILLED
 ILL-ANSWER.indication : Request-result = LOCATIONS-PROVIDED
 ILL-ANSWER.indication : Request-result = WILL-SUPPLY
 ILL-ANSWER.indication : Request-result = HOLD-PLACED
 ILL-ANSWER.indication : Request-result = ESTIMATE
 CANCEL-REPLY.indication
 RECALL.indication
 CHECKED-IN.indication
 OVERDUE.indication
 RENEW-ANSWER.indication : answer = YES
 RENEW-ANSWER.indication : answer = NO
 LOST.indication
 DAMAGED.indication
 MESSAGE.indication
 STATUS-QUERY.indication
 STATUS-OR-ERROR-REPORT.indication
 EXPIRED.indication

The following ILL APDUs can be sent to the remote ILL ASE:

ILL-REQUEST
 CONDITIONAL-REPLY : answer = YES
 CONDITIONAL-REPLY : answer = NO
 CANCEL
 RECEIVED - This action is optional.
 RETURNED - This action is optional.
 RENEW
 LOST
 DAMAGED
 MESSAGE
 STATUS-QUERY
 STATUS-OR-ERROR-REPORT

8.1.3 Responder Events

This clause describes the allowable events for a responder.

The events relating to service primitive requests from the ILL service-user are:

FORWARD.request
SHIPPED.request
ILL-ANSWER.request : Request-result = CONDITIONAL
ILL-ANSWER.request : Request-result = RETRY
ILL-ANSWER.request : Request-result = UNFILLED
ILL-ANSWER.request : Request-result = LOCATIONS-PROVIDED
ILL-ANSWER.request : Request-result = WILL-SUPPLY
ILL-ANSWER.request : Request-result = HOLD-PLACED
ILL-ANSWER.request : Request-result = ESTIMATE
CANCEL-REPLY.request
RECALL.request
CHECKED-IN.request
OVERDUE.request
RENEW-ANSWER.request : answer = YES
RENEW-ANSWER.request : answer = NO
LOST.request
DAMAGED.request
MESSAGE.request
STATUS-QUERY.request
STATUS-OR-ERROR-REPORT.request

The events relating to ILL APDUs received from the remote ILL ASE are the following:

ILL-REQUEST
CONDITIONAL-REPLY : answer = YES
CONDITIONAL-REPLY : answer = NO
CANCEL
RECEIVED
RETURNED
RENEW
LOST
DAMAGED
MESSAGE
STATUS-QUERY
STATUS-OR-ERROR-REPORT

The following local events can occur within the ILL service provider:

EXPIRY TIMEOUT

8.1.4 Responder Actions

The following ILL service primitives can be issued to the ILL service user:

- ILL-REQUEST.indication
- CONDITIONAL-REPLY.indication : answer = YES
- CONDITIONAL-REPLY.indication : answer = NO
- CANCEL.indication
- RECEIVED.indication
- RETURNED.indication
- RENEW.indication
- LOST.indication
- DAMAGED.indication
- MESSAGE.indication
- STATUS-QUERY.indication
- STATUS-OR-ERROR-REPORT.indication
- EXPIRED.indication

The following ILL APDUs can be sent to the remote ILL ASE:

ILL-REQUEST

SHIPPED - This action is optional.

FORWARD-NOTIFICATION

ILL-ANSWER : Request-result = CONDITIONAL

ILL-ANSWER : Request-result = RETRY

ILL-ANSWER : Request-result = UNFILLED

ILL-ANSWER : Request-result = LOCATIONS-PROVIDED

ILL-ANSWER : Request-result = WILL-SUPPLY

ILL-ANSWER : Request-result = HOLD-PLACED

ILL-ANSWER : Request-result = ESTIMATE

CANCEL-REPLY

RECALL

CHECKED-IN - This action is optional.

OVERDUE

RENEW-ANSWER : answer = YES

RENEW-ANSWER : answer = NO

LOST

DAMAGED

MESSAGE

STATUS-QUERY

STATUS-OR-ERROR-REPORT

EXPIRED

8.1.5 Intermediary Events and Actions

This clause describes the allowable events for an intermediary. An intermediary participating in a chained or partitioned ILL-transaction plays both the roles of requester and responder.

In the role of requester, the intermediary events and actions are the same as for a requester, although the states may differ.

In the role of responder, the intermediary events and actions are the same as for a responder, although the states may differ. The one difference is that the SHIPPED APDU is mandatory.

8.2 Procedural Rules for All Parties

8.2.1 Sending and Receiving APDUs

With the exception of the FORWARD service, each request service primitive results in the preparation and transmission of the APDU of the corresponding name.

In the case of the FORWARD.request, two APDUs are prepared: an ILL-REQUEST APDU is sent to the new responder, while a FORWARD-NOTIFICATION APDU is sent to the requester.

The receipt of a valid APDU results in a corresponding indication service primitive.

APDUs are prepared and sent only upon the explicit request of the ILL service user, with the exception of the EXPIRED APDU which is sent by the responder's system in the case of timer expiry.

8.2.2 Transaction Phases

An ILL-transaction can have two phases: processing and tracking. The processing phase is mandatory for all ILL-transactions while the tracking phase is applicable only for ILL-transactions where a returnable item, e.g. a monograph, is supplied.

The processing phase for the requester includes all events and actions up to and including the receipt of the requested item. This phase normally terminates in the RECEIVED state.

The processing phase for the responder includes all events and actions up to and including the shipping of the requested item. This phase normally terminates in the SHIPPED state.

For the intermediary requester, the processing phase includes all events and actions up to and including receipt of the SHIPPED indication; for the intermediary responder the processing phase includes all events up to and including issuing the SHIPPED request. For both the intermediary requester and responder, the processing phase normally terminates in the SHIPPED state.

The tracking phase includes all events and actions after shipping and receipt of a returnable item, including renewals, overdues and item return.

The existence of a tracking phase for an ILL-transaction is indicated by the RETURN protocol variable. A value of TRUE indicates that the tracking phase is applicable and the associated procedures must be followed. A value of FALSE indicates that the tracking phase is not required and the corresponding events are not permitted. There is no tracking phase for ILL-transactions involving non-returnable items, e.g. a photocopy.

The responder sets the RETURN variable when the triggering event is SHIPPED.request. If the service data element shipped-service-type is equal to LOAN then RETURN is set to TRUE; if the service data element shipped-service-type is equal to COPY/NON-RETURNABLE then RETURN is set to FALSE.

The requester sets the RETURN variable when the triggering event is RECEIVED.request. If the service data element shipped-service-type is equal to LOAN then RETURN is set to TRUE, if the service data element shipped-service-type is equal to COPY/NON-RETURNABLE then RETURN is set to FALSE.

8.2.3 Optional Messages

8.2.3.1 Simple Transactions

For a simple ILL-transaction, four of the ILL protocol actions are optional: send SHIPPED APDU; send RECEIVED APDU; send RETURNED APDU; and send CHECKED-IN APDU. An application-entity-invocation may send optional APDUs whenever it wants to, and in addition is obliged to send them in certain situations.

The initiator of an ILL-transaction can inform the responder of what it is capable of supplying and what it requires in the way of optional messages within the ILL-REQUEST.

The ILL-REQUEST can specify:

- a. Whether the requester is capable of sending RECEIVED.
- b. Whether the requester is capable of sending RETURNED.
- c. Whether the requester requires SHIPPED.
- d. Whether the requester requires CHECKED-IN.
- e. Whether the requester desires SHIPPED; this choice is meaningful only if choice c. above is NO.
- f. Whether the requester desires CHECKED-IN; this choice is meaningful only if choice d. above is NO.

Correspondingly, the ILL-ANSWER and the SHIPPED can specify:

- a. Whether the responder is capable of sending SHIPPED.
- b. Whether the responder is capable of sending CHECKED-IN.
- c. Whether the responder requires RECEIVED.
- d. Whether the responder requires RETURNED.
- e. Whether the responder desires RECEIVED; this choice is meaningful only if choice c. above is NO.
- f. Whether the responder desires RETURNED; this choice is meaningful only if choice d. above is NO.