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Information and documentation — Open Systems Interconnection — Interlibrary Loan Application Service Definition

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The UK participation in its preparation was entrusted to Technical Committee IDT/2/7, Computer applications in Information and Documentation.

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

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INTERNATIONAL STANDARD

ISO 10160

Third edition
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Information and documentation — Open Systems Interconnection — Interlibrary Loan Application Service Definition

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

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Foreword

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

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 46, *Information and documentation*, Subcommittee SC 4, *Technical interoperability*.

This third edition cancels and replaces the second edition (ISO 10160:1997) of which it constitutes a minor revision.

It also incorporates the Amendment ISO 10160:1997/Amd 1:2002.

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Introduction

The purpose of the Interlibrary Loan (ILL) standard is to provide a set of Application Layer services which can be used by libraries to perform loan-related activities in an Open Systems Interconnection (OSI) environment, as defined by ISO 7498.

The goal of Opens Systems Interconnection is to allow, with a minimum of technical agreement outside the interconnection standards, the interconnection of information processing systems:

— from different manufacturers;

— under different managements;

— of different levels of complexity; and

— of different technologies.

The ILL service provides capabilities to request the loan of returnable bibliographic items, such as books, or to request non-returnable items, such as photocopies of journal articles. Related procedures, such as loan renewal, item recall, overdue notification, etc. are also supported by this service.

The purpose of the service definition is to define the communications aspects of ILL processing in terms of a set of services provided to a user by an application-service-element (ASE). Performing an ILL-transaction involves a user invoking the services in the prescribed order.

The focus of ILL activity is the bibliographic item, which may be a book, periodical, journal article, microform, etc. The ILL application is concerned with procedures relating to the loan of these items between libraries or to the interchange of copies thereof.

This service definition strives to satisfy a number of objectives, including:

— Control of ILL-transactions. The services must provide a means of controlling the ILL-transaction in terms of constraining allowable actions, exchanging information, tracking a borrowed item, and synchronizing the activity of the two or more sites involved in the ILL-transaction.

— Interworking of various systems. The ILL activity will continue to be performed using a combination of manual and automated systems. The ILL service and protocol must recognize this fact and allow systems with varying degrees of automation to be able to interwork, i.e. communicate with each other in a meaningful way.

— Minimizing the costs of ILL-transactions. The costs associated with an ILL-transaction include both operator costs and communications costs. An ILL protocol should attempt to minimize the costs incurred by implementations conforming to the protocol. This can be done by minimizing the operator intervention required by the protocol implementation, and by minimizing the number of messages sent between the sites involved in an ILL-transaction.

— Reflection of current ILL practices. The purpose of defining a protocol is not to introduce a new method for performing an ILL-transaction, but rather to formalize current practices in a way that allows existing systems to communicate with each other in a standardized way, as well as to allow newer automated systems to take full advantage of the protocol's potential. However, it is recognized that this International Standard may not be universally applicable to all existing ILL systems without some modification, due to the wide variation in their capabilities.

There is an inherent trade off in any attempt to reconcile these divergent objectives. For example, minimizing ILL-transaction costs may result in some loss of control over the ILL-transaction. Reducing the number of messages sent lowers the telecommunications cost and also lowers the operator costs as there is less need for the operator to initiate and control the communications operations. However, by reducing the total number of messages, some level of information regarding the ILL-transaction is lost as is the co-ordination between the requesting and responding libraries. By reducing the total number of stages through which an ILL-transaction must go (i.e. states), the operator interface of an automated system can be made simpler, with an associated reduction in requisite demands on the operator.

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The approach taken in this International Standard is to set the mandatory requirements that all open systems must support in order to achieve an acceptable degree of coordination between automated parties to an ILL-transaction. Additional optional features are defined which allow implementors to achieve a greater degree of control if it is desired.

NOTE The mandatory requirements of this International Standard might however exceed the capabilities and/or needs of some existing manual or semi-automated ILL systems.

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 outside the scope of this International Standard.

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

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Information and documentation — Open Systems Interconnection — Interlibrary Loan Application Service Definition

1 Scope

This International Standard is an Application Layer standard within the Open Systems Interconnection framework defined by ISO 7498.

This International Standard defines the services for Interlibrary Loan. These services are provided by the use of the ILL protocol in conjunction with the supporting telecommunications service which might be a store-and-forward messaging service, such as that provided by the MOTIS Standard, ISO/IEC 10021-4; or a direct connection-mode service using ISO 8822 and ISO 8649.

This International Standard does not specify individual implementations or products, nor does it constrain the implementation of entities and interfaces within a computer system. Computer systems might 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 might 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.

There is no requirement for conformance to this International Standard. Conformance is required only for the ILL protocol specification.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

3 Terms and definitions

For the purposes of this document, the following definitions apply.

3.1 Reference model definitions[1)]

3.1.1
application-entry
aspects of an application-process pertinent to OSI

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

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3.1.2
Application Layer
seventh and highest layer in the Reference Model for Open Systems Interconnection (OSI), which serves as the window between correspondent application-processes which are using the OSI to exchange meaningful information

3.1.3
application-protocol-data-unit
unit of data specified in an application-protocol and consisting of application-protocol-information and possibly application-user-data

3.1.4
application-service-element
that part of an application-entity which provides an OSI environment capability, using underlying services when appropriate

3.1.5
(N)-service
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 1 to entry: An application-service does not provide a capability to higher layer entities, but rather to application-processes.

3.1.6
presentation-service
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* (3.1.2)

3.2 Application Layer structure definitions[2)]

3.2.1
application-association
cooperative relationship between two *application-entity-invocations* (3.2.4) 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

3.2.2
application-context
set of rules shared in common by two *application-entity-invocations* (3.2.4) governing their behaviour in order to enable their cooperative operation

Note 1 to entry: An application-context is a shared conceptual schema for the universe of discourse for communication.

3.2.3
application-context-definition
description of an *application-context* (3.2.2)

3.2.4
application-entity-invocation
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* (3.2.5)

3.2.5
application-process-invocation
specific utilization of part or all of the capabilities of a given application-process in support of a specific occasion of information processing

---

2) This International Standard makes use of the following terms defined in ISO/IEC 9545.

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3.3 Service conventions definitions[3)]

3.3.1
indication primitive
representation of an interaction in which a *service-provider* (3.3.6) 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* (3.3.7) at the peer service-access-point

3.3.2
non-confirmed service
distinct part of the total *(N)-service* (3.1.5) which does not result in an explicit confirmation from the *service-provider* (3.3.6) to the initiating *service-user* (3.3.7)

3.3.3
provider-initiated service
distinct part of the total *(N)-service* (3.1.5) which is initiated by the *service-provider* (3.3.6) rather than the *service-user* (3.3.7)

3.3.4
request primitive
representation of an interaction in which a *service-user* (3.3.7) invokes some procedure

3.3.5
service primitive
abstract, implementation-independent representation of an interaction between *service-user* (3.3.7) and the *service-provider* (3.3.6)

3.3.6
service-provider
abstract of the totality of those entities which provide a service to peer *service-users* (3.3.7)

3.3.7
service-user
entity in a single open system that makes use of a service

3.4 ILL definitions

3.4.1
bibliographic item
monograph, serial, microform, film, video recording, sound recording or other item of information held by a library or some organization

Note 1 to entry: A bibliographic item may assume different forms, e.g. a book may be printed on paper or represented electronically.

3.4.2
chained ILL-transaction
ILL-transaction (3.4.5) involving three or more parties, i.e. a *requester* (3.4.14), a *responder* (3.4.15) and one or more *intermediaries* (3.4.9), where each intermediary acts as a relay for all ILL messages

3.4.3
electronic delivery
delivery of an electronic representation of a requested item via a telecommunication-based service

3) This International Standard makes use of the following terms defined in ISO/IEC 10731.

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3.4.4
final-responder
institution which supplies a requested item

Note 1 to entry: 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.

3.4.5
ILL-transaction
single, complete instance of the whole ILL cycle, including all of the actions, *service primitives* (3.3.5) and messages involved from the initial ILL-REQUEST until the cycle is concluded, as with the return of the requested material

3.4.6
ILL-transaction group
set of related *ILL-transactions* (3.4.5) initiated by the same *requester* (3.4.14)

3.4.7
ILL-transaction state
information describing the current processing status of an *ILL-transaction* (3.4.5), which is the combination of the requester state, the responder state and the states of all intermediaries involved in an ILL-transaction

3.4.8
initial-requester
person or institution which initiates an *ILL-transaction* (3.4.5)

Note 1 to entry: 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.

3.4.9
intermediary
responder (3.4.15) which either forwards a request to another library or institution for processing, or initiates chained or partitioned sub-transactions with other responders

3.4.10
item
monograph, serial, microform, film, video recording, sound recording or other item of information held by a library or some organization

3.4.11
parameter
functionally related group of one or more data elements

3.4.12
partitioned ILL-transaction
ILL-transaction (3.4.5) involving three parties, i.e. a *requester* (3.4.14), a *responder* (3.4.15) and an *intermediary* (3.4.9), where the intermediary acts as a relay of ILL messages during the *processing phase* (3.4.13), and where the requester and responder interact directly during the *tracking phase* (3.4.20)

3.4.13
processing phase
that phase of an *ILL-transaction* (3.4.5) up to and including shipment of a requested item

3.4.14
requester
party which has generated an ILL-REQUEST

3.4.15
responder
party which has received an ILL-REQUEST

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3.4.16
simple ILL-transaction
ILL-transaction (3.4.5) involving only two active parties, a *requester* (3.4.14) and *responder* (3.4.15)

3.4.17
sub-transaction
part of an *ILL-transaction* (3.4.5) involving interactions between an *intermediary* (3.4.9) and a *responder* (3.4.15) or another intermediary

3.4.18
supplier
party that has supplied the requested item

Note 1 to entry: It need not be the same as the final-responder.

3.4.19
terminal state
state from which no transition to another state can be made

EXAMPLE When a photocopy is provided, SHIPPED is the terminal state for the responder, RECEIVED is the terminal state for the requester. CANCELLED is a terminal state for both the requester and responder.

3.4.20
tracking phase
phase of an *ILL-transaction* (3.4.5) after shipment and receipt of a returnable item, including renewals, overdues and item return

3.4.21
user
entity in a single open system that makes use of a service

4 Abbreviations

ACID Atomicity, Consistency, Isolation and Durability

ASE Application Service Element

ASO Application Service Object

ILL Interlibrary Loan

MOTIS Message Oriented Text Interchange System

OSI Open Systems Interconnection

5 Conventions

This International Standard uses the conventions defined in ISO/IEC 10731.

6 Service model

6.1 Service-user and service-provider

The ILL application is modelled as a distributed collection of application-processes, each of which is located in a separate real open system, e.g. a library system.

Within each application-process, there are two types of functions: local processing functions; and communications-related functions, i.e. OSI-related functions. The local processing functions deal with such activities as database manipulation, report generation, etc.; these are outside the scope of

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this International Standard. Within each system, those aspects of the application-process which are pertinent to OSI are called the application-entity.

Each application-entity in turn includes one or more application-service-elements (ASEs), one of which is the ILL ASE. These ASEs provide communications-related services to the service-user. To do this they engage in protocol exchanges with peer application-entities in other systems and they take advantage of supporting services within the Application Layer and the layers below it. Relationships with other ASEs are defined as part of an application-context-definition. This is outside the scope of this International Standard.

The set of all ILL ASEs, supporting ASEs and the lower layer services across all systems together form the ILL service-provider.

6.1.1 Roles of the service-user

A service-user involved in ILL activity takes on one of three roles: requester, responder or intermediary.

The requester generates ILL requests.

The responder receives ILL requests and is the potential supplier of requested items.

The intermediary is a responder which does not itself satisfy an ILL request and which passes the request to another responder on behalf of the requester.

The actual supplier of requested items is normally a responder; however, the service model allows for institutions that do not receive ILL requests, as defined in this standard, to supply the requested items. For example, an institution that supports only postal and telephone ILL requests may have another institution that supports electronic ILL requests act as a responder on its behalf.

6.2 ILL-transaction

An ILL-transaction is 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. The term “ILL-transaction” is used in this International Standard in its most general sense, and does not imply an atomic unit of work with the ACID properties of atomicity, consistency, isolation and durability, as applied to transactions in the OSI transaction processing model (ISO/IEC 10026-1).

ILL-transactions may overlap in time, i.e. multiple ILL-transactions may be processed concurrently by a given open system.

An ILL-transaction may be initiated only by a requester.

A sub-transaction refers to the set of communications activity involving an intermediary and a responder or another intermediary, and is related to an ILL-transaction initiated by a requester. A sub-transaction is not, in itself, an actual ILL-transaction.

A sub-transaction may be initiated only by an intermediary.

When an ILL-transaction involves three or more parties, the initial-requester is the party that generated the initial ILL-REQUEST. The final-responder is the last recipient of an ILL-REQUEST for that ILL-transaction.

Individual ILL-transactions may be related to each other, for example a succession of attempts by a requester to contact different responders directly. Such ILL-transactions form an ILL-transaction group. It is at the discretion of the initiator to determine whether such ILL-transactions are to be related explicitly through the ILL-transaction identifier; such grouping of ILL-transactions may be done for example to provide a historical record of the related steps associated with an interlibrary loan.

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Each ILL-transaction has a unique ILL-transaction identifier that is used to identify the state and other descriptive information maintained by ILL-application-entities for that ILL-transaction. The ILL-transaction identifier has the following components:

— **initial-requester-id**: identification of the requester who initiated the ILL-transaction;

— **ILL-transaction-group-qualifier**: distinguishes a group of ILL-transactions from all other active ILL-transaction groups associated with the initial-requester;

— **ILL-transaction-qualifier**: distinguishes an ILL-transaction from all other ILL-transactions within an ILL-transaction group.

The ILL-transaction identifier of each sub-transaction has the following additional component, which is unique within, and only within, the scope of a single intermediary:

— **sub-transaction-qualifier**: distinguishes this sub-transaction from all other sub-transactions within an ILL-transaction initiated by the intermediary.

6.3 ILL-transaction types and topologies

There are three types of ILL-transactions: simple, chained and partitioned.

6.3.1 Simple ILL-transaction

A simple ILL-transaction involves two active parties: the requester and responder. In its most basic manifestation, the requester and responder interact in a point-to-point manner, as illustrated in Figure 1.

All ILL-transactions initiated by a requester begin as simple ILL-transactions. A requester may, however, indicate as part of the ILL request that the responder has permission to change the ILL-transaction-type to chained or partitioned. If the responder does change the type, this responder then becomes an intermediary.

When a responder is unable to respond successfully to a request, it may supply a list of potential responders to assist the requester.

6.3.2 Chained ILL-transaction

A chained ILL-transaction involves at least three parties: the requester, the responder and one or more intermediaries. An ILL request is passed from one intermediary (to another intermediary) to the responder in a chain, with each intermediary acting as a relay for all ILL messages. There is no direct interaction between the requester and responder.

The interactions between the requester and the first intermediary define the main ILL-transaction. The set of interactions between an intermediary and the responder constitute a sub-transaction, as do the interactions between each pair of intervening intermediaries. Figure 2 a) illustrates a chained ILL-transaction with two intermediaries (and hence two sub-transactions).

If a sub-transaction results in non-fulfillment of the ILL request, the intermediary may initiate a new sub-transaction to another responder. The intermediary may try several potential responders in turn. This leads to a star ILL-transaction topology with the intermediary as the hub, as illustrated in Figure 2 b).

The responder may supply a list of potential responders to the intermediary to assist it in making a selection.

The requested item could be delivered directly to the requester or client, or to one of the intermediaries who would then be responsible for delivering it to the requester or client.

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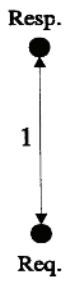
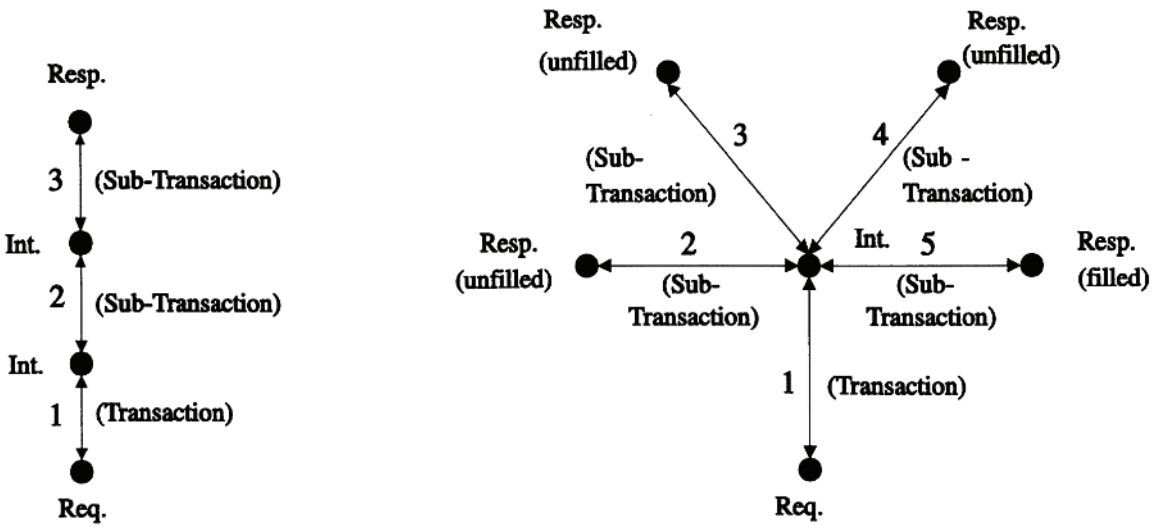


Key

Req.	requester	●	system
Resp.	responder	1,2,3…	order of interactions

Figure 1 — Simple transaction



a) Chained with two intermediaries **b) Star topology**

Key

Req.	requester	●	system
Resp.	responder	1,2,3…	order of interactions
Int.	intermediary		

Figure 2 — Chained transactions

The requester can allow or prohibit chaining and can specify, if desired, a list of potential responders to which a request might be chained. It can also supply a list of responders which have already been tried, so that unnecessary duplication of ILL requests does not occur.

6.3.3 Partitioned ILL-transaction

A partitioned ILL-transaction involves at least three parties: the requester, the responder, and one or more intermediaries. An ILL request is passed from the intermediary to the responder who responds to the intermediary, who then responds to the requester. After the desired item has been shipped and the requester has received notification that it has been shipped, all further interactions take place directly between the requester and responder; the intermediary no longer participates in the ILL-transaction. Figure 3 illustrates a partitioned ILL-transaction.

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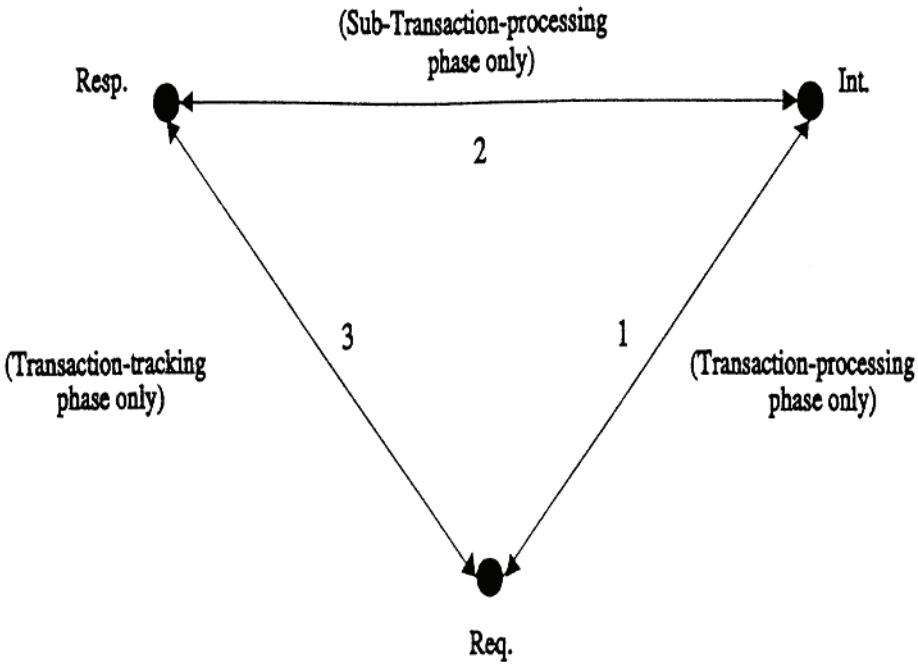
Partitioned ILL-transactions are useful in situations where the intermediary acts as an agent of the requester to find a suitable responder but has no interest in participating any further in an ILL-transaction. This is typical of some union catalogue facilities.

A partitioned ILL-transaction is divided into two phases. The first phase, the "processing phase", consists of interactions between the requester and the responder via the intermediary or intermediaries. During this phase, the sets of interactions between intermediaries and between the intermediary and a responder constitute sub-transactions. The second phase of the main ILL-transaction, the "tracking phase", consists of the direct interactions between the requester and responder. It is used for monitoring the progress of the loaned item, including recalls, renewals, overdues, etc. ILL-transaction phases are described more fully in 6.4.5.



Key

Req.	requester	●	system
Resp.	responder	1,2,3…	order of interactions
Int.	intermediary		

Figure 3 — Partitioned transaction

The requested item could be delivered directly to the requester or client, or to the intermediary who would then be responsible for delivering it to the requester or client.

The requester can allow or prohibit partitioning and can specify, if desired, a list of potential responders to which a request might be sent. It can also supply a list of responders which have already been tried, so that unnecessary duplication of ILL requests does not occur.

When a responder is unable to respond successfully to a request, it may supply a list of potential responders to assist the requester.

Partitioning and chaining may be mixed within the same ILL-transaction, as illustrated in Figure 4. Note that when partitioning occurs after chaining, as shown in Figure 4 a), it overrides chaining, the effect being the same as multiple instances of partitioning. However, if chaining follows partitioning, then the chaining effect is preserved.

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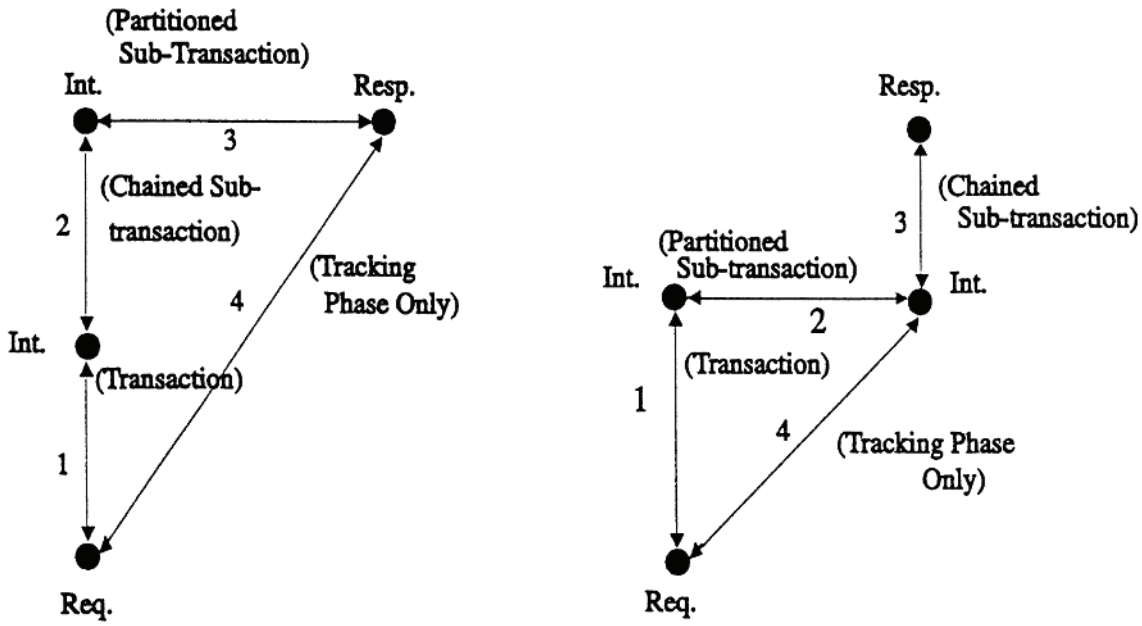
6.3.4 Distinct ILL-transactions

The preceding descriptions of chained and partitioned ILL-transactions imply that the intermediary plays only a relay role during the tracking phase, i.e. it does not invoke any services such as OVERDUE on its own initiative.

The ILL service model also allows a potential intermediary to instead play an active role during the processing phase of ILL-transactions, and exert control over all phases of an ILL-transaction by establishing distinct ILL-transactions for its interactions with the requester and with the responder. A system which receives an ILL request may act as a final responder (from the viewpoint of the intial requester), and act as an initial requester in a second transaction which it initiates with the final responder. These distinct transactions are not required to share any common identification and need not proceed in a synchronized fashion. All linkage between events on one ILL-transaction and events on the other is at the discretion and under the control of the dual-role system. This permits the dual-role system, for example, to initiate an OVERDUE request without having received an OVERDUE indication from the responder.



a) Chained then partitioned **b) Partitioned then chained**

Key

Req.	requester	●	system
Resp.	responder	1,2,3…	order of interactions
Int.	intermediary		

Figure 4 — Mix of chaining and partitioning

The one constraint on the use of distinct ILL-transactions is that all items supplied by a final-responder must be shipped and returned via the dual-role system. This ensures that the dual-role system is able to track the progress of the two ILL-transactions and can reach terminal states.

This style of operation, since it involves two distinct simple ILL-transactions, has no protocol implications, and is not described further in this International Standard.

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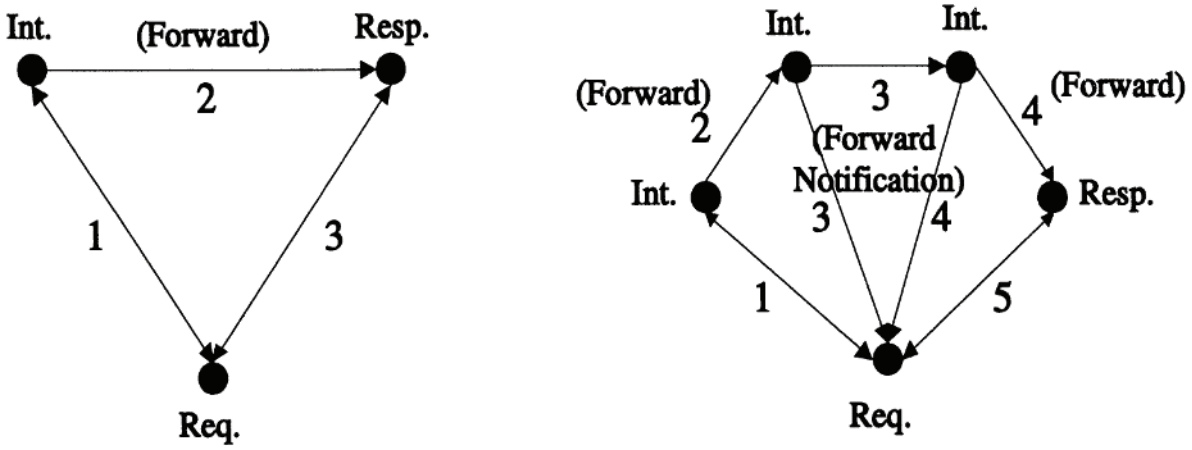
6.3.5 Forwarding

A variation of the simple ILL-transaction involves an intermediary who forwards an ILL request to a responder and then ceases to participate actively in the ILL-transaction. The responder receiving the forwarded request responds directly to the requester. The intermediary notifies the requester when forwarding occurs. Figure 5 a) shows the simplest case of forwarding involving only one intermediary. Figure 5 b) shows the case where multiple instances of forwarding occur.

The requester can allow or prohibit forwarding and can specify, if desired, a list of potential responders to which a request might be forwarded. It can also supply a list of responders which have already been tried, so that unnecessary duplication of ILL requests does not occur.

When a responder is unable to respond successfully to a request, it may supply a list of potential responders to assist the requester.



a) One instance of forwarding **b) Multiple instances of forwarding**

Key

Req.	requester	●	system
Resp.	responder	1,2,3…	order of interactions
Int.	intermediary		

Figure 5 — Simple transaction with forwarding

Chaining and forwarding may be mixed within the same ILL-transaction, as illustrated in Figure 6 a) and Figure 6 b).

Partitioning and forwarding also may be mixed within the same ILL-transaction, as illustrated in Figure 7 a) and Figure 7 b).

6.3.6 Referrals

When an ILL request is unfilled, the requester may choose to refer the request to another responder, as illustrated in Figure 8. Each request referral is considered to be a separate ILL-transaction which is part of the same ILL-transaction group.

As an implementation consideration, this request referral could be performed manually or automatically.

6.3.7 Retries

When an ILL request is unfilled with a reason such as RETRY, ESTIMATE or LOCATIONS-PROVIDED, the ILL-transaction or sub-transaction terminates. The requester or intermediary may choose to retry the

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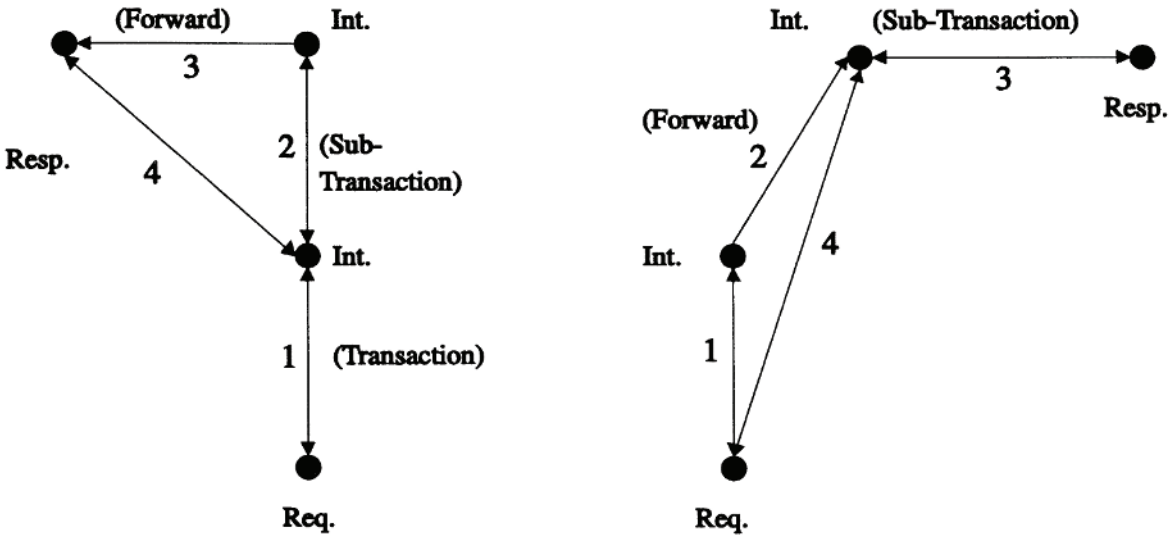
original request at an appropriate time or to look elsewhere. If the original request is repeated, it carries an indication that this is a retry. The retry is a new transaction or sub-transaction which should form part of the same ILL-transaction group as the original request.

For the initial requester a retry is a new ILL-transaction and so the ILL-transaction-qualifier must be different from that used in the original request but the ILL-transaction-group-qualifier must be the same (to enable the responder or intermediary to relate the retry to the previous ILL-transaction).

For an intermediary a retry is a new sub-transaction and so the sub-transaction-qualifier must be different from that used in the previous request, but both the ILL-transaction-group-qualifier and the ILL-transaction-qualifier must be the same (to enable the responder or next intermediary to relate the retry to the previous sub-transaction).



a) Chained then forwarded **b) Forwarded then chained**

Key

Req.	requester	●	system
Resp.	responder	1,2,3…	order of interactions
Int.	intermediary		

Figure 6 — Chained transaction with forwarding

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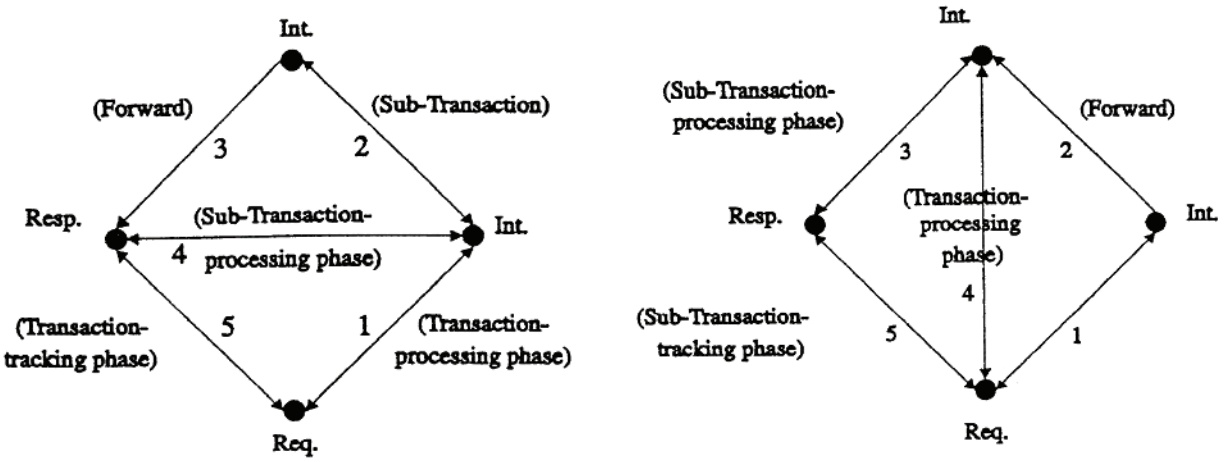
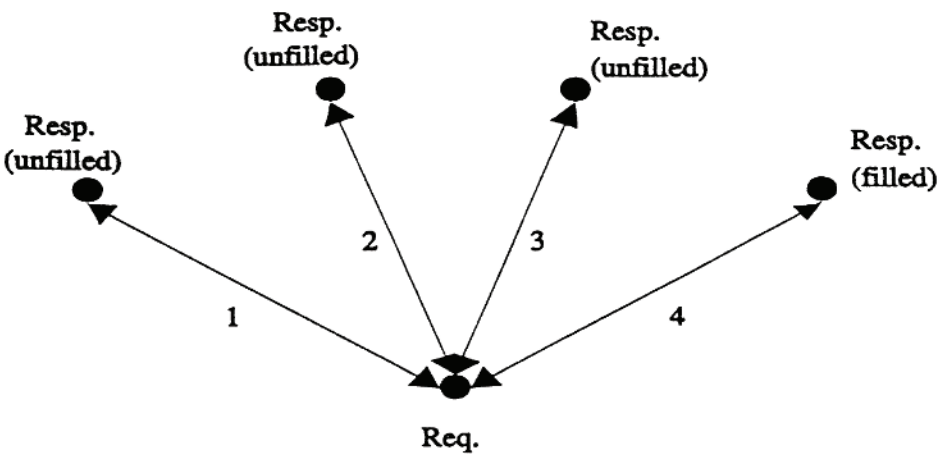


a) Partitioned then forwarded **b) Forwarded then partitioned**

Key

Req.	requester	●	system
Resp.	responder	1,2,3…	order of interactions
Int.	intermediary		

Figure 7 — Partitioned transaction with forwarding



Key

Req.	requester	●	system
Resp.	responder	1,2,3…	order of interactions

Figure 8 — Transaction referrals

6.4 ILL-transaction state

At any given time, the possible interactions that can occur between an ILL service-user and service-provider are governed by the state of the ILL-transaction.

The ILL-transaction state, i.e. the information which describes the status of processing of an ILL-transaction, is the combination of the requester state, the responder state and the states of all intermediaries involved

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in the ILL-transaction, where the requester, responder and intermediary states correspond to the ILL-transaction representation held by the application-entities within these end-systems.

Due to a requirement to support systems with reduced functionality or where telecommunications costs must be minimized, the ILL protocol supports optional messages. This means that for certain interactions, i.e. SHIPPED request, RECEIVED request, RETURNED request and CHECKED-IN request, the sending of a message is optional and, therefore a service event in one system may not result in a corresponding event in the peer system.

The state of one application-entity in an ILL-transaction cannot necessarily be inferred from the state of the other application-entity. However, services are available (i.e. the STATUS-QUERY and STATUS-OR-ERROR-REPORT services) for obtaining the current state of the other application-entity. It is never necessary for one application-entity to know the state of the other application-entity in order to determine what action is allowable. In effect, the global ILL-transaction state plays no role in controlling the behaviour of an individual end-system; only the local representation of the ILL-transaction state is significant.

Note that although the sending of messages may be optional for some services, the services themselves are carried out because the local system makes the corresponding state change (for example, when an item is received, the local system enters the RECEIVED state). This is necessary in order to maintain and control a logical sequence of events for an ILL-transaction.

6.4.1 Requester-state

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 stating 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.

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6.4.2 Responder state

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.

NOTE The states defined here are those which are meaningful in the OSI environment, i.e. are meaningful to more than one end system. Any implementation may have more information and states than are defined in this International Standard. For example, if a responder wished to differentiate between items which had not been renewed and items which had been renewed, then it could have the local states SHIPPED and RENEWED, which both would correspond to the service state SHIPPED. The remote site is not aware that the local implementation has expanded the single SHIPPED state into two local states for the purpose of enhanced local ILL-transaction control. Status reports only provide state values that are defined in this standard.

6.4.3 Terminal states

For the requester, responder and intermediary, there are certain states which, when reached, will not result in any further transitions for a given ILL-transaction. Such states are known as terminal states.

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 a 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 of 6.4.4 to relay messages suggests that this length of time may have to be sufficient to allow the information to remain accessible for the maximum loan period plus renewal periods and delivery time. For non-returnable items this 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.

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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 possible terminal states for the intermediary are:

— NOT-SUPPLIED

— FORWARD

— CANCELLED

— SHIPPED

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.

6.4.4 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.

In the role of requester, the terminal state for an intermediary is the SHIPPED state. In the role of responder, the terminal state is also the SHIPPED state. This state is terminal because of the possibility that no further messages will be received to cause any subsequent transitions.

In order to ensure that the SHIPPED state is reached within the intermediary, the SHIPPED message is mandatory for a chained or partitioned ILL-transaction.

In a chained ILL-transaction, once the intermediary is in a terminal state, it merely passes on to the requester messages received from the responder, and to the responder messages received from the requester.

6.4.5 ILL-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 to ILL-transactions where a returnable item, e.g. a monograph, is supplied.

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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.

7 Definition of services

7.1 Service features

7.1.1 General

The interaction between application-entities participating in an ILL-transaction is modelled in terms of invocation of services provided by an ILL application-service-element (e.g. requesting an item, shipping an item).

This clause provides a brief description of the ILL services, in preparation for the formal definition of services in 7.3.

7.1.2 ILL Requests

This service permits a user to request an item from an institution. If the item cannot be provided, the responder may simply respond negatively, forward the request to another institution, or initiate a chained or partitioned sub-transaction to another responder. Chained or partitioned sub-transactions are initiated by invoking an ILL request with a transaction identifier derived from the original ILL-transaction identifier.

Information supplied by the requester includes item identification information, such as the author and title, when the item is needed and by whom, the destination, and whether the item itself or a photocopy is desired.

This service also permits the requester to request a cost estimate for providing the item, the locations of an item or that a hold be placed on an item if it is not immediately available.

The requester can also control the use of forwarding, chaining and partitioning, as well as provide lists of the potential responders to which a request might be sent and the responders which have already been contacted.

This service also permits the requester to request the delivery of the item by electronic means.

7.1.3 Request Forwarding

This service allows a responder to forward a request on to another institution selected by the responder or supplied by the requester.

This service is used instead of an ILL-ANSWER in response to a received ILL-REQUEST. Once forwarding has been accomplished, the responder does not participate any further in the ILL-transaction in the sense that it does not change state. However, certain services, i.e. Status Query, Status-or-Error Report and Message, may still be used.

The responder to which a request is forwarded may respond to the requester or forward the request to another institution, if allowed.

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