
**Information technology — Message
Handling Systems (MHS)**

**Part 1:
System and service overview**

Technologies de l'information — Systèmes de messagerie (MHS)

Partie 1: Présentation générale du système et des services

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 10021-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

This part of ISO/IEC 10021 is technically aligned with ITU-T Recommendation F.400/X.400 (1999) but is not published as identical text.

This second edition cancels and replaces the first edition (ISO/IEC 10021-1:1990), which has been technically revised. It also incorporates Technical Corrigenda 1 to 7 and consolidates Amendment 1:1994.

ISO/IEC 10021 consists of the following parts, under the general title *Information technology — Message Handling Systems (MHS)*:

- *Part 1: System and service overview*
- *Part 2: Overall architecture*
- *Part 4: Message transfer system — Abstract service definition and procedures*
- *Part 5: Message store: Abstract service definition*
- *Part 6: Protocol specifications*
- *Part 7: Interpersonal messaging system*
- *Part 8: Electronic Data Interchange Messaging Service*
- *Part 9: Electronic Data Interchange Messaging System*
- *Part 10: MHS routing*
- *Part 11: MHS Routing — Guide for messaging systems managers* [Technical Report]

Introduction

This document is one of a set of Recommendations | International Standards for Message Handling. The entire set provides a comprehensive specification for a Message Handling System (MHS) comprising any number of co-operating open systems.

Message Handling Systems and Services enable users to exchange messages on a store-and-forward basis. A message submitted by one user, the originator, is conveyed by the Message Transfer System (MTS), the principal component of a larger Message Handling System (MHS), and is subsequently delivered to one or more additional users, the message's recipients.

An MHS comprises a variety of interconnected functional entities. Message Transfer Agents (MTAs) co-operate to perform the store-and-forward message transfer function. Message Stores (MSs) provide storage for messages and enable their submission, retrieval and management. User Agents (UAs) help users access MHS. Access Units (AUs) provide links to other communication systems and Services of various kinds (e.g., Telematic Services, Postal Services).

This part of ISO/IEC 10021 specifies the overall system and service description of Message Handling capabilities.

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Information technology — Message Handling Systems (MHS) —

Part 1: System and service overview

1 Scope

This part of ISO/IEC 10021 defines the overall system and service of an MHS and serves as a general overview of MHS.

Other aspects of Message Handling Systems and Services are defined in other parts of ISO/IEC 10021. The structure of ISO/IEC 10021 (all parts) defining the Message Handling System and Services is shown in Table 1.

The technical aspects of MHS are defined in other parts of ISO/IEC 10021. The overall system architecture of MHS is defined in ISO/IEC 10021-2:2003.

2 Normative references

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

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

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

ISO/IEC 8824-1:1998, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*

ISO/IEC 8825-1:1998, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

ISO/IEC 9066-1:1989, *Information processing systems – Text communication – Reliable Transfer – Part 1: Model and service definition*

ISO/IEC 13712-1:1995, *Information technology – Remote Operations: Concepts, model and notation*

ISO/IEC 9594 (all parts), *Information technology – Open Systems Interconnection – The Directory*

ISO/IEC 10021-2:2003, *Information technology – Message Handling Systems (MHS) – Part 2: Overall architecture*

ISO/IEC 10021-4:2003, *Information technology – Message Handling Systems (MHS) – Part 4: Message transfer system: Abstract service definition and procedures*

ISO/IEC 10021-5:1999, *Information technology – Message Handling Systems (MHS) – Part 5: Message store: Abstract service definition*

ISO/IEC 10021-6:2003, *Information technology – Message Handling Systems (MHS) – Part 6: Protocol specifications*

ISO/IEC 10021-1:2003(E)

ISO/IEC 10021-7:2003, *Information technology – Message Handling Systems (MHS) – Part 7: Interpersonal messaging system*

ISO/IEC 10021-8:1999, *Information technology – Message Handling Systems (MHS) – Part 8: Electronic Data Interchange Messaging Service*

ISO/IEC 10021-9:1999, *Information technology – Message Handling Systems (MHS) – Part 9: Electronic Data Interchange Messaging System*

ISO/IEC 10021-10:1999, *Information technology – Message Handling Systems (MHS) – Part 10: MHS routing*

ISO/IEC 10021-11:1999, *Information technology – Message Handling Systems (MHS) – Part 11: MHS Routing – Guide for messaging systems managers*

ISO/IEC 11588-1:1996, *Information technology – Message Handling Systems (MHS) management – Part 1: Model and architecture*

ISO/IEC 11588-3:1997, *Information technology – Message Handling Systems (MHS) management – Part 3: Logging information.*

ISO/IEC 11588-8:1997, *Information technology – Message Handling Systems (MHS) management – Part 8: Message Transfer Agent management.*

CCITT Recommendation F.423:1992, *Message handling services: Intercommunication between the interpersonal messaging service and the telefax service*

CCITT Recommendation F.440:1992, *Message handling services: The voice messaging service*

CCITT Recommendation T.330:1988, *Telematic access to interpersonal messaging system*

CCITT Recommendation X.408 (1988), *Message handling systems: Encoded information type conversion rules*

CCITT Recommendation X.440 (1992), *Message handling systems: Voice messaging system*

Table 1 – Structure of MHS Standards

Short title	Joint MHS		Joint support		ITU-T only	
	ISO/IEC	ITU-T	ISO/IEC	ITU-T	System	Service
MHS: System and service overview	10021-1	X.400				F.400
MHS: Overall architecture	10021-2	X.402				
MHS: Encoded information type conversion rules					X.408	
MHS: MTS: Abstract service definition and procedures	10021-4	X.411				
MHS: MS: Abstract -service definition	10021-5	X.413				
MHS: Protocol specifications	10021-6	X.419				
MHS: Interpersonal messaging system	10021-7	X.420				
Telematic Access to IPMS						
MHS: EDI messaging service	10021-8	F.435			T.330	
MHS: EDI messaging system	10021-9	X.435				
MHS: Voice messaging service					F.440	
MHS: Voice messaging system					X.440	
MHS: Routing	10021-10	X.412				
MHS: Routing: Guide for Messaging System Managers	10021-11	X.404				
MHS: Naming and addressing for public MH services						F.401
MHS: The public message transfer service						F.410
MHS: Intercommunication with public physical delivery services						F.415
MHS: The public IPM service						F.420
MHS: Intercommunication between IPM service and Telex						F.421
MHS: Intercommunication between IPM service and Telefax						F.423
OSI: Basic Reference Model			7498-1	X.200		
OSI: Specification of Abstract Syntax Notation One (ASN.1)			8824-1	X.680		
OSI: Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1)			8825-1	X.690		
OSI: Association Control: Service Definition			8649	X.217		
OSI: Association Control: Protocol Specification			8650-1	X.227		
OSI: Reliable Transfer: Model and service definition			9066-1	X.218		
OSI: Reliable Transfer: Protocol Specification			9066-2	X.228		
OSI: Remote Operations: Concepts, Model & Notation			13712-1	X.880		
OSI: Remote Operations: Service Definition			13712-2	X.881		
OSI: Remote Operations: Protocol Specification			13712-3	X.882		

3 Terms and definitions

For the purposes of this document, the terms and definitions given in Annex A and the following apply.

3.1 Open Systems Interconnection

This part of ISO/IEC 10021 makes use of the following terms defined in ISO/IEC 7498-1:

- Application Layer;
- application-process;
- Open Systems Interconnection;
- OSI Reference Model.

3.2 Directory Systems

This part of ISO/IEC 10021 makes use of the following terms defined in ISO/IEC 9594-1:

- a) directory entry;
- b) directory system agent;
- c) Directory System;
- d) directory user agent.

This part of ISO/IEC 10021 makes use of the following terms defined in ISO/IEC 9594-2:

- e) attribute;
- f) group;
- g) name.

4 Abbreviations

A	Additional
ADMD	Administration Management Domain
AU	Access Unit
CA	Contractual Agreement
DL	Distribution List
DSA	Directory System Agent
DUA	Directory User Agent
E	Essential
EDI	Electronic Data Interchange
EIT	Encoded Information Type
I/O	Input/Output
IP	Interpersonal
IPM	Interpersonal Messaging
IPMS	Interpersonal Messaging System
MD	Management Domain
MH	Message Handling
MHS	Message Handling System
MS	Message Store
MT	Message Transfer
MTA	Message Transfer Agent
MTS	Message Transfer System
N/A	Not applicable
OR	Originator/Recipient
OSI	Open Systems Interconnection
PD	Physical Delivery
PDAU	Physical Delivery Access Unit
PDS	Physical Delivery System
PM	Per-message
PR	Per-recipient
PRMD	Private Management Domain

PTLXAU	Public Telex Access Unit
RPOA	Recognized Private Operating Agency
TLMA	Telematic Agent
TLXAU	Telex Access Unit
UA	User Agent

5 Conventions

In this Standard, the expression “Administration” is used to indicate a telecommunication Administration, a recognized private operating agency, and, in the case of intercommunication with Public Delivery Service, a Postal Administration.

6 Purpose

This part of ISO/IEC 10021 is one of a set of Recommendations which describes the system model and elements of service of the Message Handling System (MHS) and Services. This part of ISO/IEC 10021 overviews the capabilities of an MHS that are used for the provision of MH Services to enable users to exchange messages on a store-and-forward basis.

The message handling system is designed in accordance with the principles of the Reference Model of Open Systems Interconnection (OSI Reference Model) (ISO/IEC 7498-1) and uses the Presentation Layer Services and Services offered by other, more general, Application Service Elements. An MHS can be constructed using any network fitting in the scope of OSI. The Message Transfer Service provided by the MTS is application independent. An example of a standardized application is the IPM service. End systems can use the MT Service for specific applications that are defined bilaterally.

Elements of Service are the service features provided through the Application Processes. The Elements of Service are considered to be components of the services provided to users and are either elements of a basic service or they are *optional user facilities*, classified either as *essential optional user facilities*, or as *additional optional user facilities*.

7 Functional Model of MHS

The MHS functional model serves as a tool to aid in the development of International Standards for MHS, and aids in describing the basic concepts that can be depicted graphically. It comprises several different functional components that work together to provide MH services. The model can be applied to a number of different physical and organizational configurations.

7.1 Description of the MHS Model

A functional view of the MHS model is shown in Figure 1. In this model, a user is either a person or a computer process. Users are either direct users (i.e. engage in message handling by direct use of MHS), or are indirect users [i.e. engage in message handling through another communication system (e.g. a physical delivery system) that is linked to MHS]. A user is referred to as either an originator (when sending a message) or a recipient (when receiving a message). Message Handling Elements of Service define the set of message types and the capabilities that enable an originator to transfer messages of those types to one or more recipients.

An originator prepares messages with the assistance of his User Agent. A User Agent (UA) is an application process that interacts with the Message Transfer System (MTS) or a Message Store (MS), to submit messages on behalf of a single user. The MTS delivers the messages submitted to it, to one or more recipient UAs, Access Units (AUs), or MSs, and can return notifications to the originator. Functions performed solely by the UA and not standardized as part of the message handling Elements of Service are called local functions. A UA can accept delivery of messages directly from the MTS, or it can use the capabilities of an MS to receive delivered messages for subsequent retrieval by the UA.

The MTS comprises a number of Message Transfer Agents (MTAs). Operating together, in a store-and-forward manner, the MTAs transfer messages and deliver them to the intended recipients.

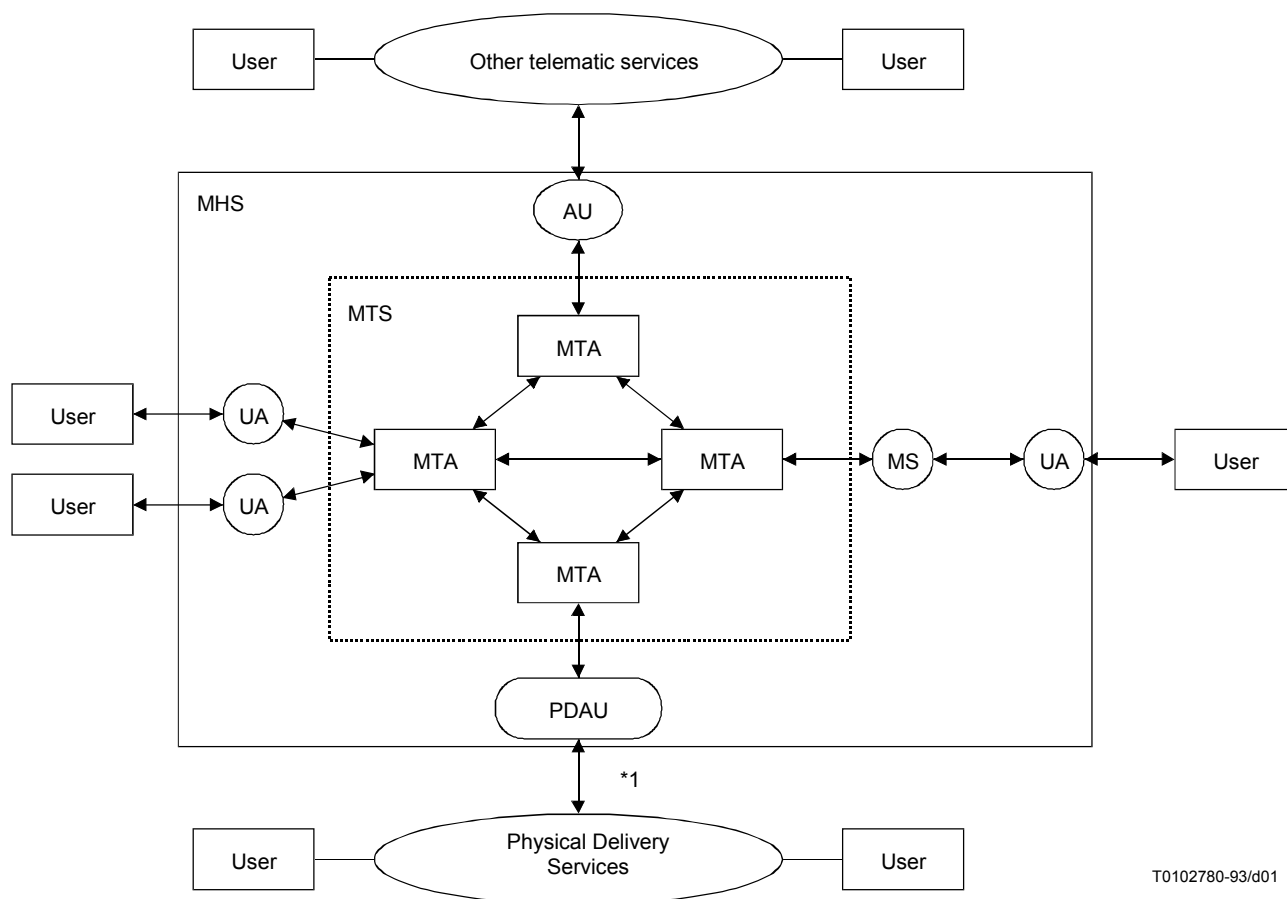
Access by indirect users of MHS is accomplished by AUs. Delivery to indirect users of MHS is accomplished by AUs, such as in the case of physical delivery, by the Physical Delivery Access Unit (PDAU).

The Message Store (MS) is an optional general purpose capability of MHS that acts as an intermediary between the UA and the MTA. The MS is depicted in the MHS Functional Model as shown in Figure 1. The MS is a functional entity whose primary purpose is to store delivered, and, optionally, submitted messages and permit their retrieval by the MS-user (UA). The MS also allows for submission from, and alerting to the MS-user.

The collection of UAs, MSs, AUs and MTAs is called the Message Handling System (MHS).

7.2 Structure of Messages

The basic structure of messages conveyed by the MTS is shown in Figure 2. A message is made up of an envelope and a content. The envelope carries information that is used by the MTS when transferring the message within the MTS. The content is the piece of information that the originating UA wishes to be delivered to one or more recipient UAs. The MTS neither modifies nor examines the content, except for conversion (see clause 16).



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* 1) Message input from PDS to MHS is not currently possible. Flow from PD services to the PDAU shown is for the purpose of notifications.

Figure 1 – MHS Functional Model

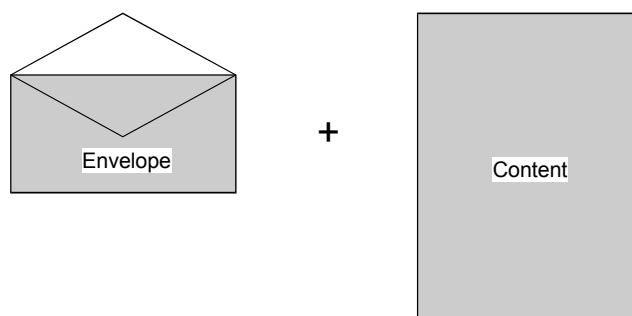


Figure 2 – Basic Message Structure

7.3 Application of the MHS model

7.3.1 Physical Mapping

Users access UAs for message processing purposes, for example, to create, present, or file messages. A user can interact with a UA via an input/output (I/O) device or process (e.g. keyboard, display, printer etc.). A UA can be implemented as a (set of) computer process(es) in an intelligent terminal.

A UA and MTA can be co-located in the same system, or a UA/MS can be implemented in physically separate systems. In the first case the UA accesses the MT Elements of Service by interacting directly with the MTA in the same system. In the second case, the UA/MS will communicate with the MTA via standardized protocols specified for MHS. It is also possible for an MTA to be implemented in a system without UAs or MSs.

Some possible physical configurations are shown in Figures 3 and 4. The different physical systems can be connected by means of dedicated lines or switched network connections.

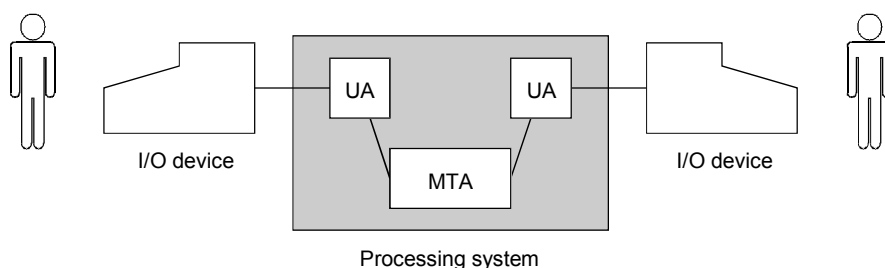


Figure 3 – Co-resident UA and MTA

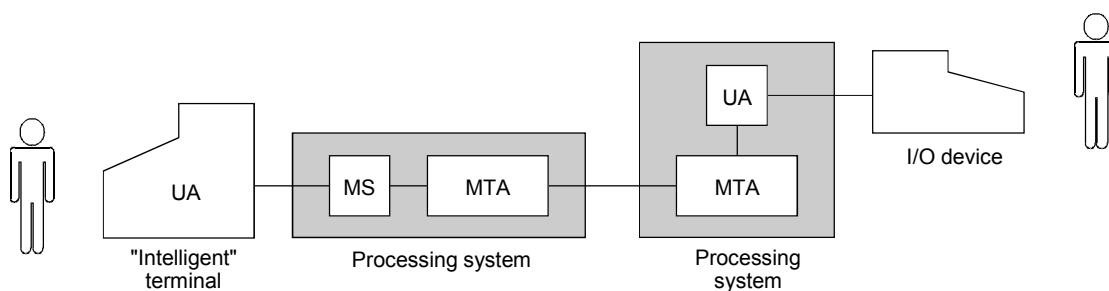


Figure 4 – Stand-alone UA and Co-resident MS/MTA and UA/MTA

7.3.2 Organizational Mapping

An Administration or organization can play various roles in providing Message Handling Services. An organization in this context can be a company or a non-commercial enterprise.

The collection of at least one MTA, zero or more UAs, zero or more MSs, and zero or more AUs constitutes a Management Domain (MD). An MD provides Message Handling Services in accordance with the classification of Elements of Service as described in clause 19. A Management Domain may be classified as either an Administration Management Domain (ADMD) or a Private Management Domain (PRMD) with the definitions given in Annex A. The relationship between Management Domains is shown in Figure 5.

7.3.3 Administration Management Domain

In one country, one or more ADMDs can exist. An ADMD is characterized by its provision of relaying functions between other Management Domains and the provision of the Message Transfer Service for the applications provided within the ADMD.

An Administration can provide access for its users to the ADMD in one or more of the following ways:

- user to Administration provided UA;
- private UA to Administration MTA;
- private UA to Administration MS;
- private MTA to Administration MTA;
- user to Administration provided AU.

See also the examples of configurations shown in Figures 3 and 4.

Administration provided UAs can exist as part of an intelligent terminal that the user can use to access MHS. They can also exist as part of Administration resident equipment being part of MHS, in which case the user obtains access to the UA via an I/O device.

In the case of a private UA, the user has a private stand-alone UA which interacts with the Administration provided MTA or MS, using submission, delivery and retrieval functions. A private, stand-alone UA can be associated with one or more MDs, provided that the required naming conventions are preserved.

A private MTA as part of a PRMD can access one or more ADMDs in a country, following national regulations.

Access can also be provided by Administration provided AUs described in clauses 10 and 11.

7.3.4 Private Management Domain

An organization other than an Administration can have one or more MTA(s), and zero or more UAs, AUs and MSs forming a PRMD which can interact with an ADMD or other PRMD on an MD-to-MD (MTA-to-MTA) basis. A PRMD is characterized by the provision of messaging functions within that Management Domain.

A PRMD can have access to one or more ADMDs as shown in Figure 5. However, in the case of a specific interaction between a PRMD and an ADMD (such as when a message is transferred between MDs), the PRMD is considered to be associated only with that ADMD. A PRMD may act as a relay to other MDs if national regulations and bilateral agreements permit.

As a national matter, the name of a PRMD can be either nationally unique or relative to the associated ADMD. If a PRMD is associated with more than one ADMD, the PRMD can have more than one name.

See Annex G of ISO/IEC 10021-2 for guidance in the case of multinational PRMDs.

7.4 The Message Store

Remote UAs can be implemented on a wide variety of equipment, including personal computers of varying capabilities. The MS service can complement a remote UA by providing continuously available storage and delivery services on behalf of a user, for example.

One MS acts on behalf of only one user, i.e. it does not provide a common or shared MS capability to several users. See also PRMD 3 of Figure 5.

The MS will store delivered messages and reports. As an option it may also store submitted messages, submitted probes, and draft messages. The MS may also keep a history of messages by storing extracts of previously and currently stored messages in logs. Messages may be grouped in a user-defined and potentially hierarchical structure.

The MS retrieval capability provides users who subscribe to an MS with basic message retrieval capabilities potentially applicable to all information held by the MS. Figure 6 shows the delivery, and subsequent retrieval of messages that are delivered to an MS, and the submission of messages via the MS.

When a user subscribes to an MS, all messages destined for the user are delivered to the MS only. The MS-user, if on line, may receive Alerts that announce the delivery of certain messages to the MS. Messages delivered to an MS are considered delivered from the MTS perspective.

The basic MS is independent of application specific services (see 8.7) and may store messages with all types of content, the type of content being dependent on the type of service. However, it may provide additional capabilities depending on the type of content.

When an MS-user submits a message, the MS conveys the submission request to the MTS and reports the outcome returned by the MTS to the MS-user. If requested by the MS-user, the MS may expand the message by forwarding parts of delivered or submitted messages that are currently stored in the MS before conveying the submission to the MTS. The MS may also store a copy of the message submitted to the MTS if the submission is successful. The MS service allows the user to transfer a message to the MS for storage as a draft message. The draft message may subsequently be retrieved, or the MS may include its body-parts in a message submitted to the MTS when requested in a message submitted by the MS-user.

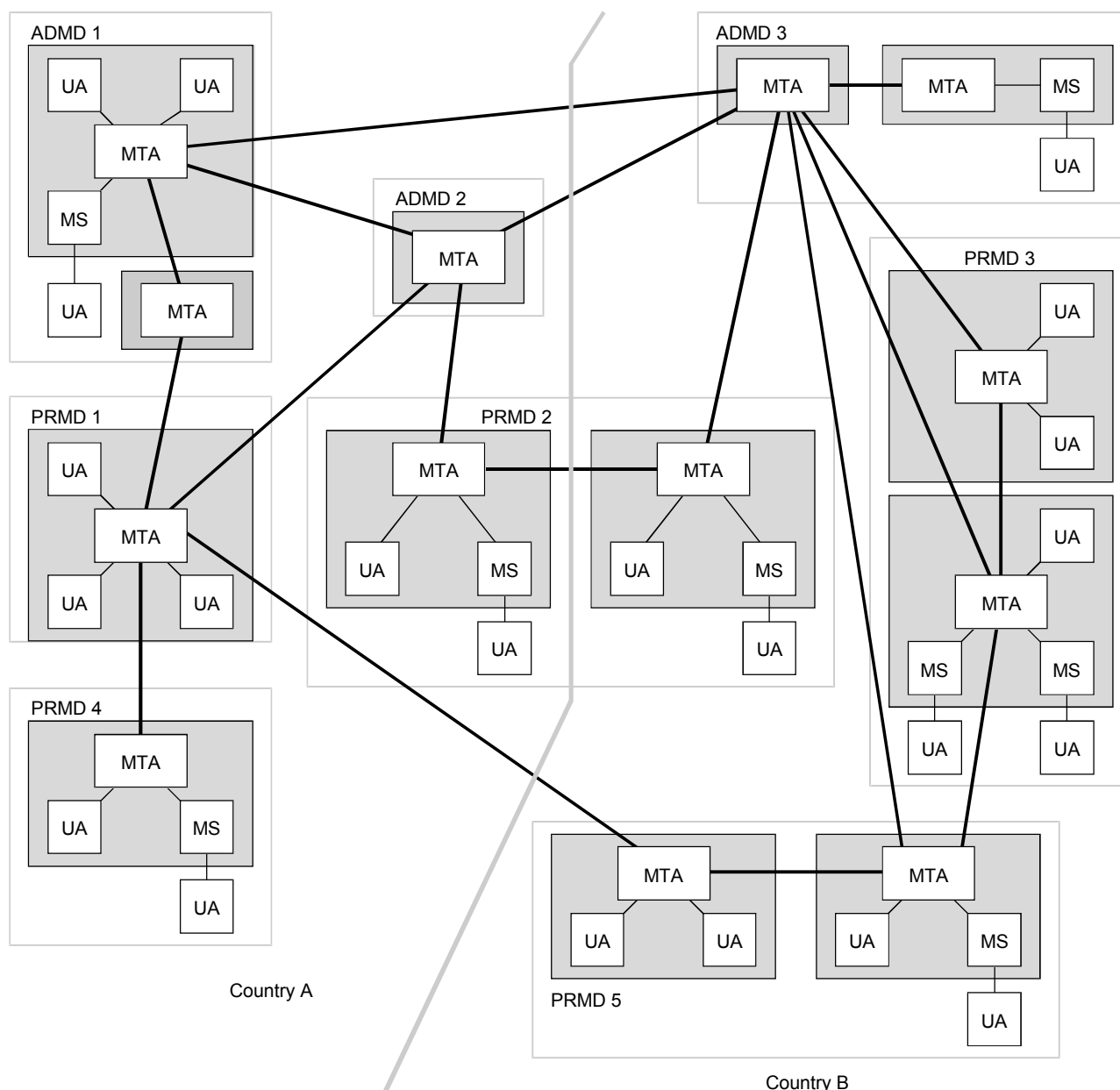
The MS-user may be provided with the capability to request the MS service to forward selected messages automatically upon delivery. The MS may also provide automatic deletion of messages after a user specified period of time, or when the message expires, or when the message is rendered obsolete by another message.

The MS may automatically attach information to a previously submitted message concerning its delivery or non-delivery. The MS may also generate content-specific notifications, acknowledging receipt or acceptance when requested by the user or when the user has retrieved the message.

The elements of service describing the features of the MS are defined in Annex B and classified in clause 19. Users are provided with the capability based on various criteria, to get counts and lists of messages, to fetch messages, and to delete messages, currently held in the MS.

Figure 7 depicts a simplified model of the information types stored in the MS, and the functions the MS fulfils.

The scope of the MS services defined in CCITT Recommendation F.400 (1988) and (1992) | ISO/IEC 10021-1:1990 was mainly limited to the storage of delivered messages and reports and their subsequent retrieval by the MS-user. The 1994 version of this part of ISO/IEC 10021 defines new extensions to provide a broader range of service facilities. These enhanced facilities particularly apply in those environments where the MS is used as a personal data base to store, retrieve, modify, and classify a user's messages, often with frequent and long-lasting interaction between the MS-user and MS. Examples of such environments might be found in local area networks, or in environments where the user employs different User Agent implementations at different locations to access one MS. In other environments where the MS is used mainly as a temporary storage system, to take delivery of messages and reports and provide for their retrieval by infrequent and short-lasting interactions, these enhanced facilities may not be required. In this latter case, some enhanced facilities may be provided locally by the MS-user itself.



NOTE 1 – This diagram gives examples of possible interconnections. It does not attempt to identify all possible configurations. This International Standard places no restrictions on interconnections between MDs, although these may be the subject of regulatory agreements within and between countries.

NOTE 2 – PRMD 1 has connections to two ADMDs within country A;

- PRMD 2 spans a country border, and has connections to an ADMD in each country;
- PRMD 3 has multiple connections to ADMD 3;
- PRMD 4 is only connected to other MDs by relaying through PRMD 1;
- PRMD 5 has connections to other PRMDs, both within the same country (to PRMD 3) and internationally (to PRMD 1).

NOTE 3 – The lines between MTAs represent logical connections, which implies that the MTAs have the ability to establish associations between themselves when required, using supporting OSI layers over any physical medium.

NOTE 4 – The shaded boxes surrounding logical components (e.g. UAs, MTAs) represent examples of physically colocated systems.

Figure 5 – Relationships between Management Domains

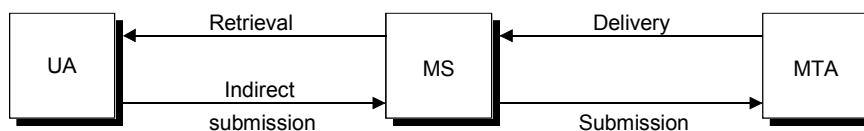
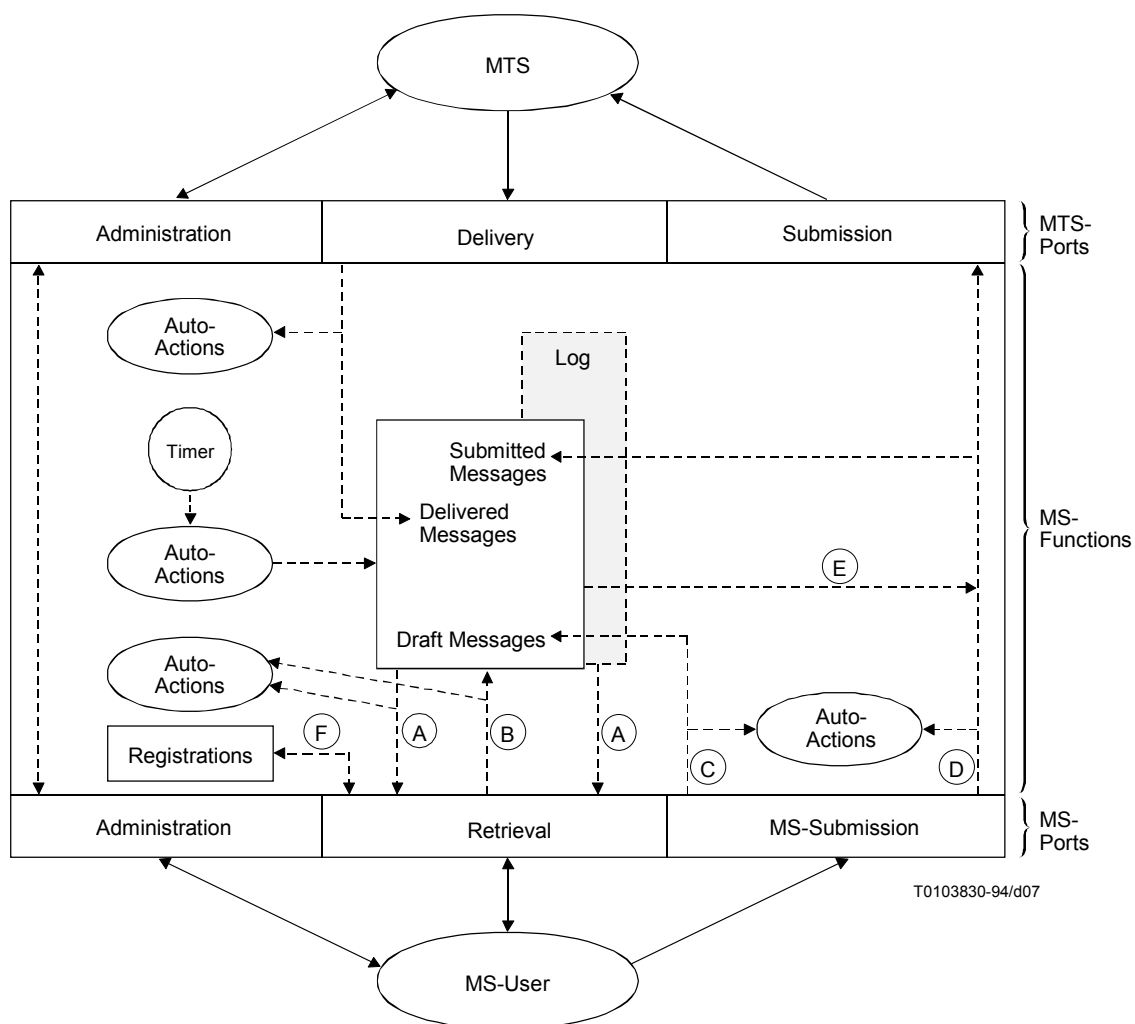


Figure 6 – Submission & Delivery with an MS



- (A) Fetch, list and summarize
- (B) Modify message attributes and
- (C) Draft storage
- (D) Submission to the MTS
- (E) Submission to the MTS with incorporation of parts of stored
- (F) Register-MS

Figure 7 – Message Store Functional Model

Consequently, the basic and essential optional requirements defined for the MS in this part of ISO/IEC 10021 are the same as those defined in versions published prior to 1994.

7.4.1 Physical Configurations

The MS can be physically located with respect to the MTA in a number of ways. The MS can be co-located with the UA, co-located with the MTA, or stand-alone. From an external point of view, a co-located UA and MS are indistinguishable from a stand-alone UA. Co-locating the MS with the MTA offers significant advantages which will probably make it the predominant configuration.

7.4.2 Organizational Configurations

Either ADMs or PRMs can operate MSs. All the subscriber's messages are delivered to the MS for subsequent retrieval.

The physical and organizational configurations described above are examples only and other equally valid cases can exist.

8 The Message Transfer Service

The MTS provides the general, application independent, store and forward Message Transfer service. The Elements of Service describing the features of the MT service are defined in Annex B, and classified in clause 19.

8.1 Submission and Delivery

The MTS provides the means by which UAs exchange messages. There are two basic interactions between MTAs and UAs, or AUs, or MSs:

- 1) The submission interaction is the means by which an originating UA or MS transfers to an MTA the content of a message and the submission envelope. The submission envelope contains the information that the MTS requires to provide the requested Elements of Service.
- 2) The delivery interaction is the means by which the MTA transfers to a recipient UA or MS the content of a message plus the delivery envelope. The delivery envelope contains information related to delivery of the message.

In the submission and delivery interactions, responsibility for the message is passed between the MTA and the UA or MS.

8.2 Transfer

Starting at the originator's MTA, each MTA transfers the message to another MTA until the message reaches the recipients' MTA, which then delivers it to the recipient UA or MS using the delivery interaction.

The transfer interaction is the means by which one MTA transfers to another MTA the content of a message plus the transfer envelope. The transfer envelope contains information related to the operation of the MTS plus information that the MTS requires to provide Elements of Service requested by the originating UA.

MTAs transfer messages containing any type of binary coded information. MTAs neither interpret nor alter the content of messages except when performing a conversion.

8.3 Notifications

Notifications in the MT Service comprise the Delivery and Non-delivery Notifications. When a message, or Probe, cannot be delivered by the MTS, a Non-delivery Notification is generated and returned to the originator in a Report signifying this. In addition, an originator can specifically ask for acknowledgment of successful delivery through use of the Delivery Notification Element of Service on submission.

8.4 User Agent

The UA uses the MT service provided by the MTS. A UA is a functional entity by means of which a single direct user engages in message handling.

UAs are grouped into classes based on the type of content of messages they can handle. The MTS provides a UA with the ability to identify its class when sending messages to other UAs. UAs within a given class are referred to as cooperating UAs since they cooperate with each other to enhance the communication amongst their respective users.

NOTE – A UA can support more than one type of message content, and hence belong to several UA classes.

8.5 Message Store

The Message Store (MS) uses the MT Service provided by the MTS. An MS is a functional entity associated with a user's UA. The user may submit messages through the MS and retrieve messages that have been either delivered to the MS, or submitted by the user.

8.6 Access Unit

An Access Unit (AU) uses the MT service provided by the MTS. An AU is a functional entity associated with an MTA to provide for intercommunication between the MHS and another system or service.

8.7 Use of the MTS in the Provision of Various Services

The MTS is used by application specific services for the provision of Message Handling Services of various types. The Interpersonal Messaging Service, described in clause 9, is one example of this. Other examples are the Electronic Data Interchange (EDI) messaging service described in CCITT Rec. F.435 | ISO/IEC 10021-8, and the Voice Messaging service described in CCITT Rec. F.440. Other services can be built on the foundation of the MTS, either with corresponding standards or as private applications.

9 The IPM Service

The Interpersonal Messaging Service (IPM Service) provides a user with features to assist in communicating with other IPM Service users. The IPM Service uses the capabilities of the MT Service for sending and receiving interpersonal messages. The Elements of Service describing the features of the IPM Service are defined in Annex B, and classified in clause 19.

9.1 IPM Service Functional Model

Figure 8 shows the functional model of the IPM Service. The UAs used in the IPM Service (IPM-UAs) comprise a specific class of cooperating UAs. The optional Access Units shown (PFAXAU, PTLXAU, TLMA) allow for Telex, and TeleFax users to intercommunicate with the IPM Service. The optional Physical Delivery Access Unit (PDAU) allows IPM users to send messages to users outside the IPM Service who have no access to MHS. The Message Store can optionally be used by IPM users to take delivery of messages on their behalf.

9.2 Structure of IP-messages

The IPM class of UAs create messages containing a content specific to the IPM. The specific content that is sent from one IPM-UA to another is a result of an originator composing and sending a message, called an IP-message. The structure of an IP-message as it relates to the basic message structure of MHS is shown in Figure 9. The IP-message is conveyed with an envelope when being transferred through the MTS.

Figure 10 shows an analogy between a typical office memo, and the corresponding IP-message structure. The IP-message contains information (e.g. To, cc, Subject) provided by the user which is transformed by the IPM-UA into the heading of the IP-message. The main information that the user wishes to communicate (the body of the memo) is contained within the body of the IP-message. In the example shown, the body contains two types of encoded information: text and facsimile, which form what are called, body parts. In general, an IP-message body can consist of a number of body parts, each of which can be of a different encoded information type, such as voice, text, files, facsimile and graphics.

9.3 IP-notifications

In the IPM Service, a user can request a notification of receipt or non-receipt of a message by a recipient. These notifications are requested by an originator and are generated as a result of some recipient action (such as reading/not reading the message). In certain cases, the Non-receipt Notification is generated automatically by the recipient's UA.

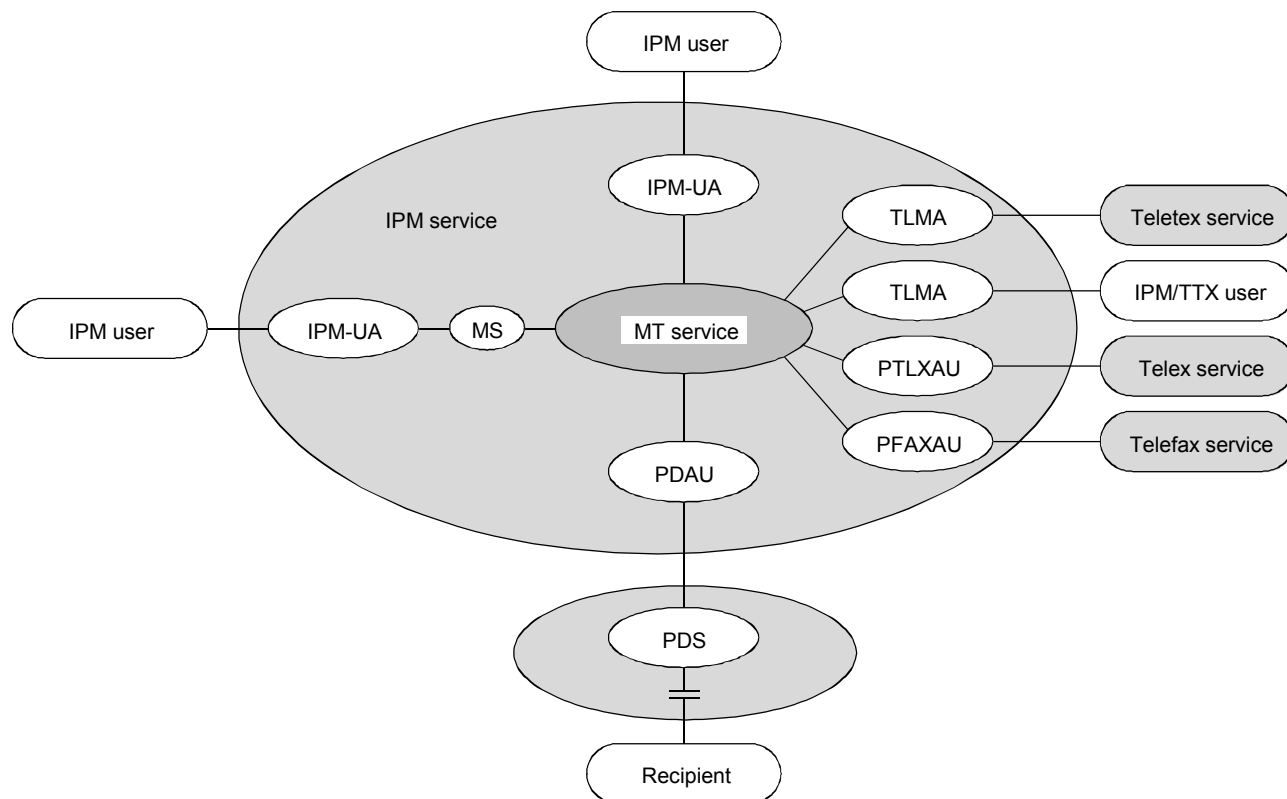


Figure 8 – IPM Service Functional Model

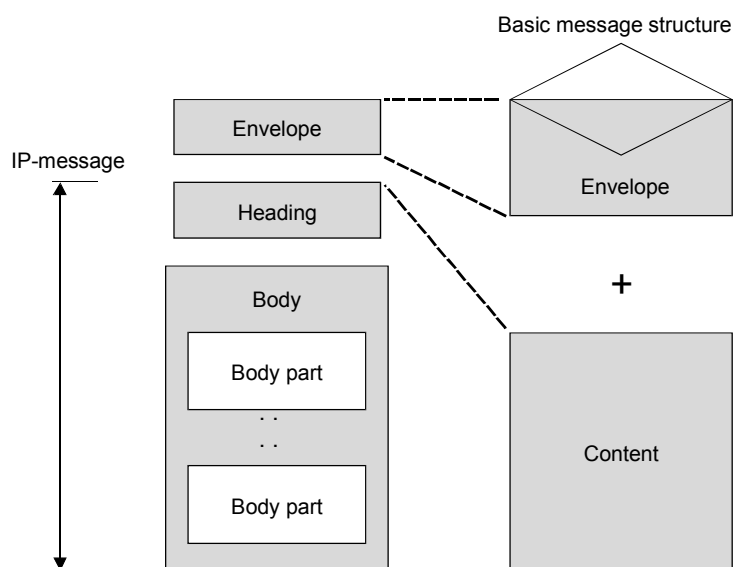


Figure 9 – IP-message Structure

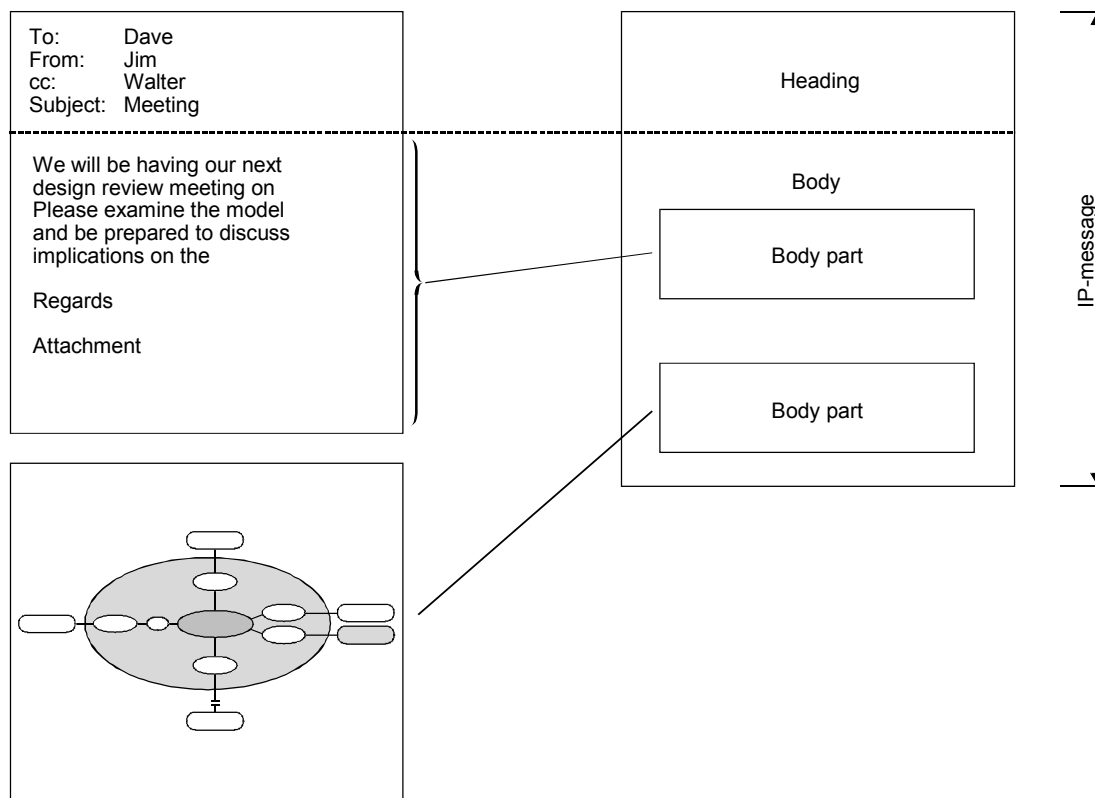


Figure 10 – IP-message Structure For a Typical Memo

10 Intercommunication with Physical Delivery Services

10.1 Introduction

The value of Message Handling Systems can be increased by connecting them to Physical Delivery (PD) Systems such as the traditional Postal Service. This will allow for the physical (e.g. hard copy) delivery of messages originated within MHS to recipients outside of MHS, and in some cases will allow for the return of notifications from the PD service to an MHS originator. The ability for origination of messages in the PD service for submission to MHS through the PDAU is not yet provided. The capability of intercommunication between PD and MH services is an optional capability of MHS, and is applicable to any application such as IPM. All users of MHS will have the ability to generate messages for subsequent physical delivery. Figure 11 shows the functional model of this interworking. The Elements of Service describing the features of this intercommunication are defined in Annex B and classified in clause 19.

A Physical Delivery System is a system, operated by a Management Domain, that transports and delivers physical messages. A physical message is a physical object comprising a relaying envelope and its content. An example of a PDS is the postal service. An example of a physical message is a paper letter and its enclosing paper envelope.

A Physical Delivery Access Unit (PDAU) converts an MH user's message to physical form, a process called physical rendition. An example of this is the printing of a message and its automatic enclosure in a paper envelope. The PDAU passes the physically rendered message to a PDS for further relaying and eventual physical delivery.

A PDAU can be viewed as a set of UAs, each UA being identified by a postal address. To perform its functions, a PDAU must support submission (Notifications) and delivery interactions with the MTS, and also cooperate with other UAs. MH/PD Service intercommunication is thus provided as part of the Message Transfer Service.

To enable MH users to address messages to be delivered physically by a PDS, an appropriate address form appropriate for this exists and is described in clause 12.

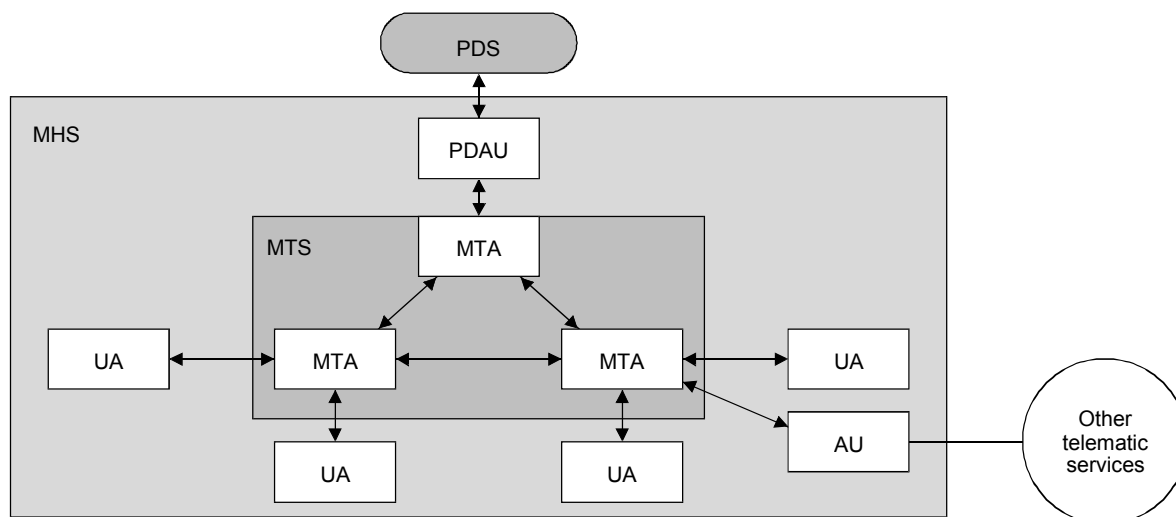


Figure 11 – Functional Model MHS-PDS

10.2 Organizational Configurations

Possible organizational mappings of the functional model described above are shown in Figure 12. In each model (A and B), the term PD domain denotes the domain of responsibility of an organization providing a PD service. In A, the PD domain comprises an MD and a PDS. The boundary between the PD domain and the rest of MHS is a boundary between MDs. In B, the PD domain comprises only the PDS; the PDAU is not part of the PD domain. The boundary between the PD domain and MHS lies at the point where the PDAU passes physical messages to the PDS.

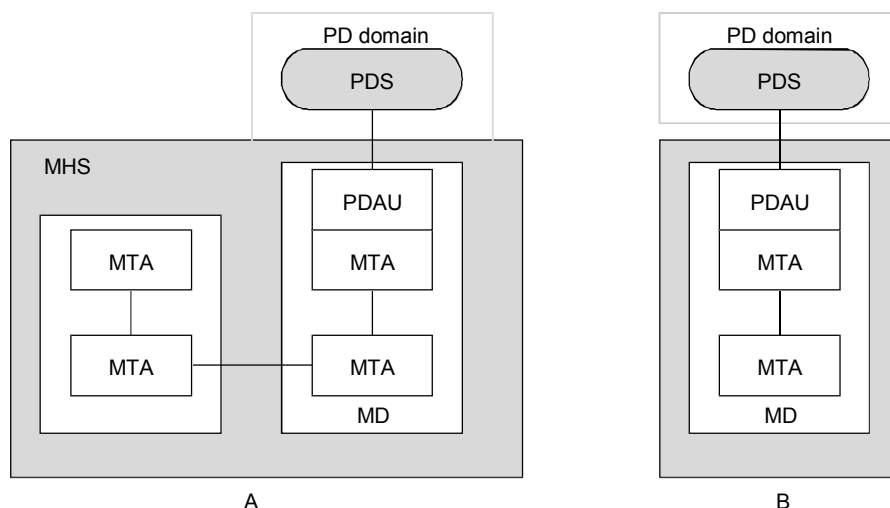


Figure 12 – Configurations for MH/PD Service Intercommunication

11 Specialized Access

11.1 Introduction

The functional model of MHS (see Figure 1) contains Access Units (AUs) to allow access between MHS and other communication systems and services. The model shows a generic Access Unit between MHS and Telematic Services.

Also shown is a Physical Delivery Access unit to allow for physical delivery of MHS messages to recipients without the need for terminal access to MHS. The access to Physical Delivery Services is available to any application carried by the MTS, through a PDAU described in clause 10.

Other forms of access are described below.

NOTE – The use of the word “public” in these descriptions refers only to the concept of unrestricted access by any user without advanced registration, in contrast to registered use. The term is not intended to imply that these access units are only provided as part of a public service; they may equally be provided within a private system.

11.2 Telex Access

11.2.1 Registered Access to the IPM Service

A Telex Access Unit (TLXAU) is defined in the technical Recommendations to allow the intercommunication between IPM users and Telex users. To provide a service with this type of AU is a national matter.

11.2.2 Non-registered (Public) Access to the IPM Service

A specialized Access Unit is defined to allow the intercommunication between IPM users and Telex users. This AU provides for public access to the IPM Service for Telex users who are not registered users of the IPM Service, and is called a Public Telex Access Unit (PTLXAU). This is shown in Figure 8. The Telex users are not subscribers to the IPM Service, but use some of the features of the IPM Service to pass messages to IPM users. IPM users can also send messages to Telex users via this AU.

11.3 Facsimile Access

11.3.1 Non-registered (Public) Access from the IPM Service

A specialized access unit is defined to allow the intercommunication between IPM users and Facsimile users. This AU provides for access from the IPM Service to Fax users who are not registered users of the IPM Service, and is called a Public Fax Access Unit (PFAXAU). This is shown in Figure 8. IPM users can send messages to Fax users via this AU. Operation of the PFAXAU in the direction Fax to IPM is for further study.

12 Naming and Addressing

12.1 Introduction

In an MHS, the principal entity that requires naming is the user (the originator and recipient of messages). In addition, distribution lists (DLs) have names for use in MHS. Users of MHS and DLs are identified by OR-names. OR-names are comprised of directory names and/or OR-addresses, all of which are described in this clause.

12.2 Directory Names

Users of the MH Service, and DLs, can be identified by a name, called a directory name. A directory name must be looked up in a directory to find out the corresponding OR-address. The structure and components of directory names are described in ISO/IEC 9594.

A user can access a directory system directly to find the OR-address of a user, or OR-addresses of the members of a DL (both of which are outside the scope of these Recommendations). As an alternative, a user can use the directory name and have MHS access a directory to resolve the corresponding OR-address or addresses automatically as described in clause 14.

An MH user or DL will not necessarily have a directory name, unless they are registered in a directory. As directories become more prevalent, it is expected that directory names will be the preferred method of identifying MHS users to each other.

12.3 OR-Names

Every MH user or DL will have one or more OR-name(s). An OR-name comprises a directory name, an OR-address, or both.

Either or both components of an OR-name can be used on submission of a message. If only the directory name is present, MHS will access a directory to attempt to determine the OR-address, which it will then use to route and deliver the message. If a directory name is absent, it will use the OR-address as given. When both are given on submission, MHS will use the OR-address, but will carry the directory name and present both to the recipient. If the OR-address is invalid, it will then attempt to use the directory name as above.

12.4 OR-Addresses

An OR-address contains information that enables MHS to uniquely identify a user to deliver a message or return a notification to him. (The prefix “OR” recognizes the fact that the user can be acting as either the originator or recipient of the message or notification in question.)

An OR-address is a collection of information called attributes. ISO/IEC 10021-2 specifies a set of standard attributes from which OR-addresses can be constructed. Standard attributes mean that their syntax and semantics are defined in ISO/IEC 10021-2. In addition to standard attributes, and to cater for existing messaging systems, there are domain defined attributes whose syntax and semantics are defined by Management Domains.

Various forms of OR-addresses are defined, each serving their own purpose. These forms and their purpose are as follows:

<u>Mnemonic OR-Address:</u>	Provides a user friendly means of identifying users in the absence of a directory. It is also used for identifying a distribution list.
<u>Terminal OR-Address:</u>	Provides a means of identifying users with terminals belonging to various networks.
<u>Numeric OR-Address:</u>	Provides a means of identifying users by means of numeric keypads.
<u>Postal OR-Address:</u>	Provides a means of identifying originators and recipients of physical messages.

13 MHS Use of Directory

13.1 Introduction

The Directory defined by ISO/IEC 9594 provides capabilities useful in the use and provision of a variety of telecommunication services. This clause describes how a directory can be used in message handling. Details can be found in other parts of ISO/IEC 10021.

The directory capabilities used in message handling fall into the following four categories:

- a) **User-friendly naming:** The originator or recipient of a message can be identified by means of his directory name, rather than his machine oriented OR-address. At any time MHS can obtain the latter from the former by consulting the directory.
- b) **Distribution lists (DLs):** A group whose membership is stored in the directory can be used as a DL. The originator simply supplies the name of the list. At the DL's expansion point MHS can obtain the directory names (and then the OR-addresses) of the individual recipients by consulting the directory.
- c) **Recipient UA capabilities:** MHS capabilities of a recipient (or originator) can be stored in his directory entry. At any time MHS can obtain (and then act upon) those capabilities by consulting the directory.
- d) **Authentication:** Before two MHS functional entities (two MTAs, or a UA and an MTA) communicate with one another, each establishes the identity of the other. This can be done by using authentication capabilities of MHS based on information stored in the directory.

Besides the above, one user can directly access the directory, for example, to determine the OR-address or MHS capabilities of another. The recipient's directory name is supplied to the directory, which returns the requested information.

13.2 Functional Model

Both UAs and MTAs can use the directory. A UA can present the directory with the directory name of the intended recipient, and obtain from the directory, the recipient's OR-address. The UA can then supply both the directory name and the OR-address to the MTS. Another UA can supply just the recipient's directory name to the MTS. The MTS would then itself ask the directory for the recipient's OR-address and add it to the envelope. The originating MTA normally carries out the name-to-OR-address look-up using access rights granted to the MTA.

A functional model depicting the above is shown in Figure 13.

13.3 Physical Configurations

Some possible physical configurations of the above functional model are shown in Figure 14. Where a Directory User Agent (DUA) and Directory System Agent (DSA) reside in physically separate systems, a standard directory protocol, defined in ISO/IEC 9594, governs their interactions. It will often be desirable to physically co-locate a UA or MTA with a DUA/DSA. However, other physical configurations are also possible.

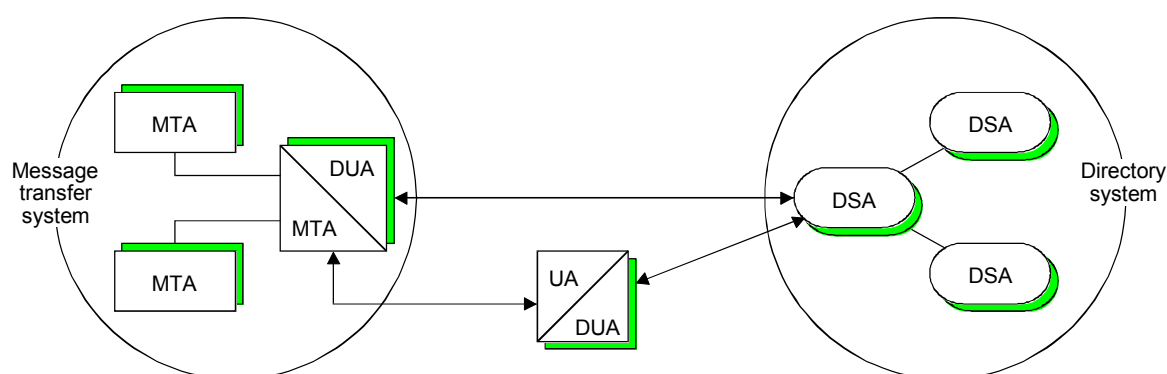


Figure 13 – Functional Model of MHS-Directory Interworking

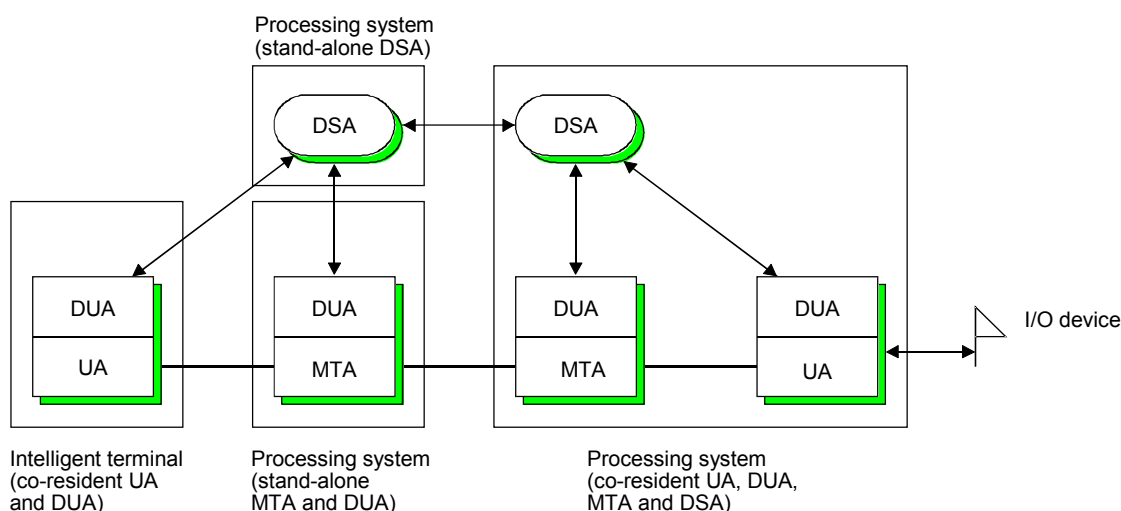


Figure 14 – Physical Configurations for MHS-Directory Interworking

14 Distribution Lists in MHS

14.1 Introduction

The ability to make use of a Distribution List (DL) is an optional capability of MHS provided through the MT Service. DL Expansion allows a sender to have a message transmitted to a group of recipients, by naming the group instead of having to enumerate each of the final recipients.

14.2 Properties of a DL

The properties of a DL can be described as follows:

DL Members:	Users and other DLs that will receive messages addressed to the DL.
DL Submit Permission:	A list of users and other DLs which are allowed to make use of the DL to send messages to the DL's members.
DL Expansion Point:	Each DL has one or more OR-addresses, each of which unambiguously identifies the DL. When a message is addressed to a DL, the OR-address is used to locate an expansion point, which is a domain or MTA where the names of the members of the DL are added to the recipient list. The message is transported to the expansion point before expansion, as shown in Figure 15. There may be more than one MTA capable of acting as the DL expansion point for a particular DL, especially if the Directory is used to store the membership of the DL.
DL Owner:	A user who is responsible for the management of a DL.

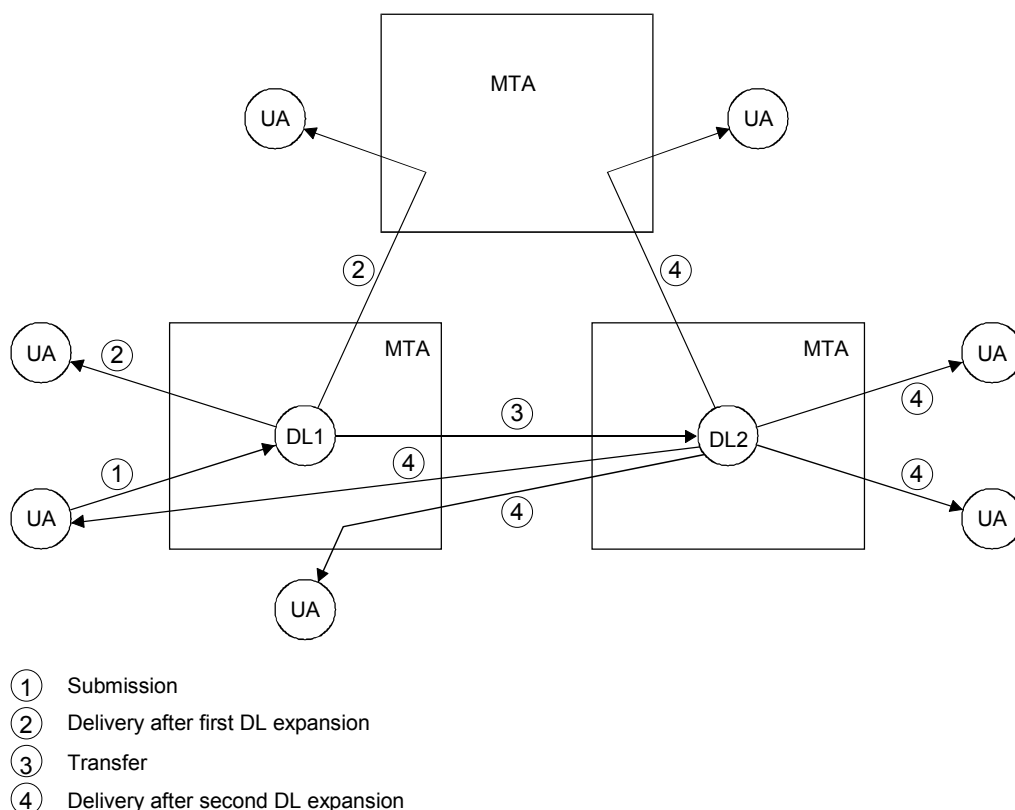


Figure 15 – Distribution List Expansion

14.3 Submission

Submission of a message to a DL is similar to the submission of a message to a user. The originator can include in the DL's OR-name, the directory name, the OR-address, or both (see clause 12 for details). The originator need not be aware that the OR-name used is that of a DL. The originator can, however, through use of the Element of Service, DL Expansion Prohibited, prohibit the MTS from expanding a message unknowingly addressed to a DL.

14.4 DL Use of a Directory

A directory may or may not be used to store information about the properties of a DL. Among the information that can be stored are the following: DL members, DL owner, DL submit permission and the DL expansion point.

14.5 DL Expansion

At the expansion point, the MTA responsible for expanding the DL will:

- a) Look up the information about the DL, e.g. in the directory, using access rights granted to the MTA.
NOTE – Since this is done by the MTA at the expansion point, support of DLs in MHS does not require a globally interconnected directory.
- b) Verify whether expansion is allowed by checking the identity of the sender against the DL's submit permission.
- c) If expansion is allowed, add the members of the DL (except any exempted recipients) to the list of recipients of the message and transmit the message to them.

14.6 Nesting

A member of a DL can be another DL as shown in Figure 15. In this case the message is forwarded from the expansion point of the parent DL for further expansion. Thus during each expansion, only the members of a single DL are added to the message.

During expansion of a nested DL, the identity of the parent DL (e.g. DL1 in Figure 15) rather than that of the message originator, is compared against the submit permission of the member DL (e.g. DL2 in Figure 15).

NOTE – DL structures can be defined which reference a particular nested DL more than once at different levels of the nesting. Submission to such a parent DL can cause a recipient to receive multiple copies of the same message. The same result can occur if a message is addressed to multiple DLs which contain a common member. Correlation of such copies can be done at the recipient's UA, and/or in the MS.

14.7 Recursion Control

If a certain DL is directly or indirectly a member of itself (a situation which can validly arise), or when DLs are combined with redirection, then a message might get back to the same list and potentially circulate infinitely. This is detected by the MTS and prevented from occurring.

14.8 Delivery

On delivery of the message, the recipient will find out that he received the message as a member of a DL, and through which DL, or chain of DLs he received the message.

14.9 Routing Loop Control

A message can be originated in one domain/MTA, expanded in a second domain/MTA, and then sent back to a DL member in the first domain/MTA. The MTS will not treat this as a routing loop error.