INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

F.471

(08/97)

SERIES F: NON-TELEPHONE TELECOMMUNICATION SERVICES

Message handling services

Operational requirements for the interconnection of voice-mail store-and-forward units

ITU-T Recommendation F.471

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION F.471

OPERATIONAL REQUIREMENTS FOR THE INTERCONNECTION OF VOICE-MAIL STORE-AND-FORWARD UNITS

Summary

This Recommendation describes the general principles and operational aspects of the voice-mail store-and-forward service defined in Recommendation F.472 when operated and interconnected between service providers. It also addresses the elements of service offered by Voice-mail Store-and-Forward Units (Voice SFUs) to its direct user, a voice-mail system and between Voice SFUs.

This service is designed to be implemented in conjunction with Recommendation F.472 which describes the voice-mail store-and-forward service.

Source

ITU-T Recommendation F.471 was prepared by ITU-T Study Group 7 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 9th of August 1997.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. The ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, the ITU had/had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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Recommendation F.471

OPERATIONAL REQUIREMENTS FOR THE INTERCONNECTION OF VOICE-MAIL STORE-AND-FORWARD UNITS

(Geneva, 1997)

1 Scope

This Recommendation describes the general principles and operational aspects of the voice-mail store-and-forward service defined in Recommendation F.472 when operated and interconnected between service providers. It also addresses the elements of service offered by Voice-mail Store-and-Forward Units (Voice SFUs) to its direct user, a voice-mail system, and between Voice SFUs.

This service is designed to be implemented in conjunction with Recommendation F.472 which describes the voice-mail store-and-forward service.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, onstitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

– ITU-T Recommendation F.472 (1997), *Service and operational requirements of the voice-mail store-and-forward service.*

– ITU-T Recommendation F.400/X.400 (1996), *Message handling: System and service overview.*

– CCITT Recommendation F.440 (1992), *The voice messaging service.*

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

– CCITT Recommendation G.721 (1990) (See ITU-T Recommendation G.726.)

– CCITT Recommendation G.726 (1992) (Has replaced former CCITT Recs. G.721 and G.723), *40, 32, 24, 16 kbit/s Adaptive Differential Pulse Code Modulation (ADPCM).*

– ITU-T Recommendation G.728 – Annex G (1994), *16 kbit/s fixed point specification.*

– IETF RFC ???? – April 1997 – *Voice Profile for Internet Mail (VPIM) – Version 2.*

NOTE – This new reference is incomplete as the document is not yet published. It is expected to be published in April 1997 as an Internet Proposed Standard. At such time as the additional reference information is known (RFC number and publication date) the TSB editor will be advised by the document editor.

3 Abbreviations

This Recommendation uses the following abbreviations:

A	Additional EOS (defined in 3.1/F.472)
ADPCM	Adaptive Differential Pulse Code Modulation
B	Basic EOS (defined in 3.1/F.472)
DEST	Destination Voice SFU
E	Essential EOS (defined in 3.1/F.472)
EOS	Element of Service
IETF	Internet Engineering Task Force
Level 1	Level 1 notification

Level 2	Level 2 notification
ORIG	Origination
REC	Reception
SFU	Store-and-Forward Unit
TRANS	Transit voice SFU
VM S&F	Voice-Mail Store-and-Forward
VMS	Voice-Mail System
VPIM	Voice Profile for Internet Mail

4 Definitions

This Recommendation incorporates by reference the terms listed below from Recommendation F.472.

Message submission

Recipient address

Transfer system

Transit facility

Voice-mail message

Voice-mail message delivery

Voice-mail message transfer

Voice-mail notifications

Voice-mail system

Voice-mail system service interface

Voice SFU

Voice signature

5 Introduction

A growing number of service providers are offering voice-mail store-and-forward services to their customers. For the efficient and economical extension of these services across international boundaries, there is a need to specify the service elements used to provide these services. This Recommendation, along with Recommendation F.472, is designed to meet these needs. Recommendation F.472 defines a VM S&F service to enable the international interconnection of disparate VMS equipment, while this Recommendation defines the operational aspects of international interconnection of Voice SFUs to realize the VM S&F service.

The VM S&F is comprised of one or more domains where a domain is a logical entity that incorporates at least a single Voice SFU and one or more VMSs, though not indicated in this figure.

Figure 1 identifies the scope of both this Recommendation and Recommendation F.472. Furthermore, it identifies the following four (4) points of interaction.

5.1 Interaction between the VMS and its direct user

The interaction point between the VMS and its direct user is identified as "1" in Figure 1. The direct user consumes the services of the VMS identified in Recommendation F.472. The concrete realization of support for these services by a VMS is considered to be a local matter.

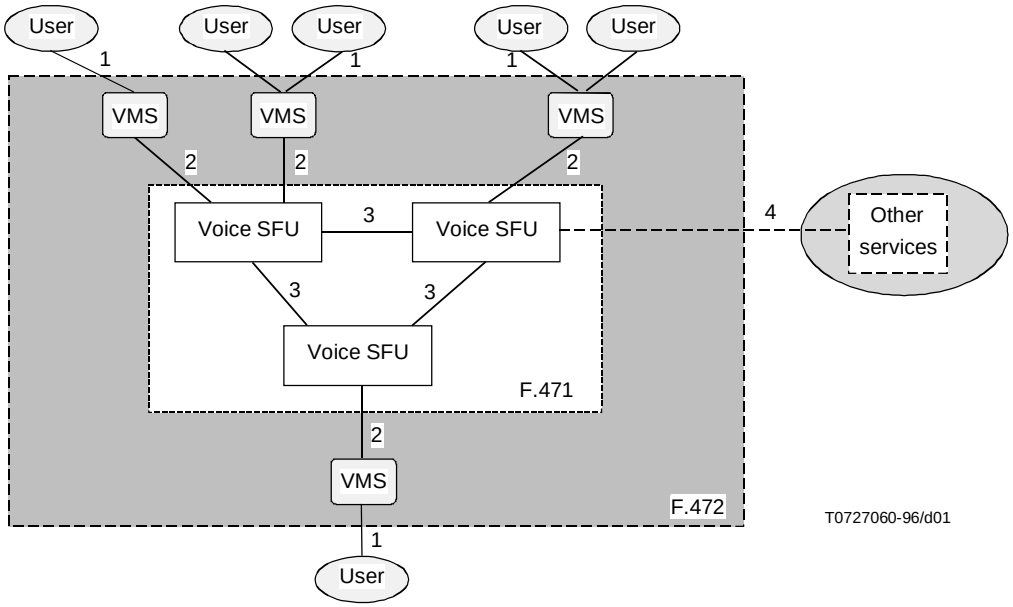

Figure 1/F.471 – Voice-mail store-and-forward service overview

5.2 Interaction between a Voice SFU and its direct user (i.e. VMS)

The interaction point between a Voice SFU and its direct user is identified as "2" in Figure 1. The direct user consumes the services of a Voice SFU identified in Recommendation F.472. The concrete realization of support for these services by a Voice SFU is considered to be a local matter.

5.3 Interaction between Voice SFUs

The interaction point between Voice SFUs is identified as "3" in Figure 1. It is understood that the intercommunication of Voice SFUs employs a transfer mechanism, such as the message transfer service specified in Recommendation F.410. A Voice SFU consumes transfer services as well as the services provided by its correspondent Voice SFU as identified in this Recommendation. The concrete realization of support for these services by a Voice SFU is considered to be a local matter.

5.4 Interaction between a Voice SFU and direct users of other services

The interaction point between a Voice SFU and an indirect user who is a direct user of another service is identified as "4" in Figure 1. The indirect user through its association with other services may consume all or some of the services identified in this Recommendation for direct users. The concrete realization of support for these services may be the subject of future standardization.

6 Overview

This Recommendation defines the set of operational network services offered by voice-mail store-and-forward service providers for the interconnection of Voice SFUs, as well as voice-mail store-and-forward services offered by service providers to a direct user (a VMS). Message transfer services employed for the interconnection of voice-mail systems and/or services are also identified herein.

6.1 Interconnection

The following two types of Voice SFU interconnection, as illustrated in Figures 1 and 2, have been identified:

- Directly interconnected: Two or more VM S&F services and their associated Voice SFUs intercommunicating directly, i.e. without relaying through another VM S&F service.
- Indirect interconnection: Two or more VM S&F services and their associated Voice SFUs intercommunicating by relaying through another VM S&F service and its associated Voice SFU.

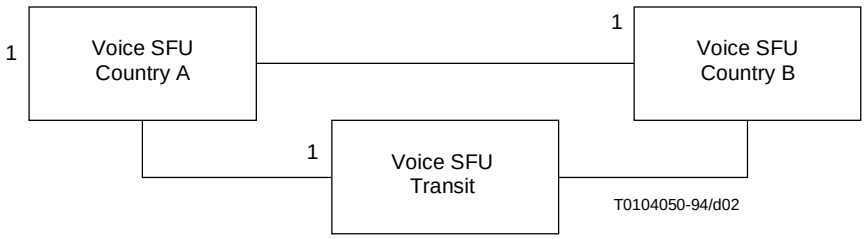

Figure 2/F.471 – Voice SFU interworking scenarios

Although not expressly shown, Figure 2 also implies the services offered by the Voice SFU to its direct user as depicted in Figure 1.

Interconnection between Voice SFUs and message handling systems may be provided by the transfer system. Details are for further study.

6.2 Technical requirements

Technical requirements of the service are covered in other publications, e.g. in the relevant G- and X-Series Recommendations. The protocol used to concretely realize the interconnection of Voice SFUs with one another and with VMSs is a local matter. However, interconnection of Voice SFUs using the Message Handling System (MHS) is recommended and interconnection using the Voice Profile for Internet Mail (VPIM) is optional.

6.3 Accounting and settlement

Accounting and settlement aspects are covered in D-Series Recommendations. Voice SFUs shall record and store sufficient information for charging and settlement of accounts, when applicable.

7 Interconnection requirements

7.1 General

In the interconnection of Voice SFUs, the responsibility to deliver single and multi-address messages is transferred from the originating Voice SFU to one or more destination Voice SFUs.

7.2 Information exchange

The basic unit of communication between VM S&F services is a message. Two types of messages are defined: a voice-mail message and a voice-mail notification.

7.2.1 Voice-mail message

Voice-mail message is described in and imported from Recommendation F.472 (see 4.13 and throughout).

7.2.2 Voice-mail notifications – Level 1 and Level 2 notifications

Voice-mail notifications requirements are established in 7.2.4/F.472 and described in terms of elements of service as specified in Table 1 and Table 2.

Level 1 notifications support the services identified in Table 1, and convey the semantics of successful or unsuccessful transfer of responsibility for the message to the destination Voice SFU in the recipient's VM S&F service or a redirecting Voice SFU.

Level 1 notifications shall be generated for all message transfers.

NOTE 1 – As defined in 1.1/F.440, if the message is redirected to another recipient by a delivery Voice SFU, interim Level 1 notifications may be received by the originating Voice SFU and its direct user.

Level 2 notifications shall be generated only if requested by the originator as indicated by the value of the original message "class of service indication" EOS, i.e. it conveys the value of "certified" receipt requested.

Level 2 notifications support the services identified in Table 2, and convey the semantics of successful or unsuccessful transfer of responsibility for the message from the destination Voice SFU to the recipient's voice-mail system.

NOTE 2 – Depending on local implementation of this service, a Level 2 notification may indicate that the responsibility for the message was accepted by the voice-mail system or the message was delivered to the recipient's mailbox at the destination voice-mail system.

Table 1/F.471 – Level 1 notification service elements (Level 1)

Element of service	Orig.	Rec.	EOS # F.472 and F.400 Annex A/B reference
Message identification	B	B	B.41/F.400
Originator indication (to provide the "notification originator identification")	B	B	B.55/F.400
Message recipient (to provide the "original message recipient indication")	B	B	A.5/F.472
Original encoded information types indication	B	B	B.54/F.400
Delivery report (to provide): – the date and time of delivery or failure; – failure reason and diagnostic information.	B	B	A.20/F.400
Class of message delivery	B	B	A.2/F.472
B Basic feature as defined in F.472.			

7.3 Voice encoding

To ensure compatibility between all Voice SFUs, the audio voice message is to be digitally encoded according to Recommendation G.726 which defines 32 kbit/s ADPCM. However, other encodings may be used (e.g. Recommendation G.728 LD-CELP) but conversion facilities to and from Recommendation G.726 must be provided as noted in 8.8.

7.4 Transit arrangements

The use of transit service elements for message transfer is subject to agreement of the service providers involved. Transit EOS support classification is identified in Table 3 as a column titled "TRANS".

A voice message may pass through a transit facility consisting of a Voice SFU or some other transfer system. Voice SFUs offering transit, redirection, distribution list expansion or relay services shall support Level 1 notifications.

Table 2/F.471 – Level 2 notification service elements (Level 2)

Element of service	Orig.	Rec.	EOS # F.472 and F.400 Annex A/B reference
Message identification	B	B	B.41
Originator indication (to provide "notification originator identification")	B	B	B.55
Message recipient (to provide the "original intended message recipient indication")	B	B	A.5/F.472
Original encoded information types indication	B	A	A.33
Class of message delivery	B	A	A.2/F.472
Notification details (to provide): – responsibility acceptance or non-acceptance indication; – date and time; – failure reason and diagnostic information; – message duration[a)]; – delivery duration[a)]; – receiving terminal identification[a)]; – time last attempted[a)]; – number of attempts[a)]; – delivered message duration [a)].	E	B	A.7/F.472
[a)] As defined in 1.1/F.440.			

Where a message contains a multiple recipient address, it shall be possible for the transit facility to accept responsibility for some recipient addresses and to onward transfer to one or more Voice SFUs or transfer systems the responsibility for other recipient addresses.

The transfer of messages between VM S&F service providers is subject to bilateral agreements.

8 Service interworking principles

The classification of the interworking requirements is shown in Table 3.

8.1 Message addressing

8.1.1 Recipient addressing

The delivery address of the message is the network address specifying the intended recipient of the message.

8.1.1.1 Single address message

In the interconnection of Voice SFUs a single address shall be supported.

8.1.1.2 Multiple address message

In the interconnection of Voice SFUs multiple addresses should be supported.

8.1.1.3 Distribution list identifier

Expansion of distribution lists should be performed at the originating Voice SFU. Expansion of distribution lists at other Voice SFUs may be supported as part of the delivery service.

8.1.2 Originator addressing

The address of the originator of a message is the originator's network address or the originator's VMS identification.

Table 3/F.471 – Interworking requirements of Elements of Service (EOS)

Service element requirement	ORIG	TRANS	DEST	Subclause ref.
Single address message	E	E*	E	8.1.1.1
Multiple address message	A	E*	E	8.1.1.2
Distribution list identifier	A	N/A	N/A	8.1.1.3
Message identification	E	E	E	8.2
Class of service – delivery schedule	E	E*	E	8.3.1
Class of service – precedence service level	C	E*	E	8.3.2
Deferred delivery	C	N/A	N/A	8.4
Envelope	C	N/A	N/A	8.5
Successful message transfer notification (positive Level 1)	A	E	E	8.6
Unsuccessful message transfer notification (negative Level 1)	E	E	E	8.6
Successful message delivery notification (positive Level 2)	A	A	A	8.7
Unsuccessful message delivery notification (negative Level 2)	A	A	A	8.7
Voice coding encoding conversion	A	N/A	A	8.8

E* Special kind of essential. In the case that the transit Voice SFU does not take responsibility for any message delivery, the service element shall be conveyed.

N/A Not applicable.

ORIG Originating Voice SFU.

8.2 Message identification

On successful submission of a message, the originating Voice SFU shall assign a globally unique identification to the message. The message identifier is used to identify the message in notifications between Voice SFUs.

8.3 Classes of service

In the interconnection of Voice SFUs two classes of service elements shall be supported:

1) Delivery schedule.

2) Precedence service level.

8.3.1 Delivery schedule

Two classes of **delivery schedule** are defined as urgent and routine according to the quality of service requirements set forth in clause 9.

8.3.2 Precedence service level

Two classes of **precedence service level** are defined: private and certified.

In the case of *private* messages, the destination SFU shall block attempts to forward the voice message to a destination other than that identified in the envelope (see 8.5).

In the case of *certified* messages, the destination SFU shall provide a Level 2 notification to the originating Voice SFU.

8.4 Message deferral

The storage of messages to the customer specified time for message delivery should be carried out by the originating Voice SFU.

8.5 Envelope

The envelope shall be transferred from the originating Voice SFU to the destination Voice SFU. Table 4 specifies the VM S&F service envelope contents.

Table 4/F.471 – VM S&F service information provided to the user

Information	Provided by
Voice signature information	O/D (Note 1)
Voice subject information	O/D (Note 1)
Recipient addressing information includes: – address (box number); – organization; – organizational unit(s); – physical address lines; – voice-mail network address.	O
Message information	
intended duration, minutes	O
class of service – delivery schedule	O
class of service – precedence service level	O
submission date and time	O
message reference	O
Originator addressing information includes: – address (box number); – organization; – organizational unit(s); – physical address lines; – voice-mail network address.	O
Additional recipients	Note 2
O Provided by originating Voice SFU. D Provided by destination Voice SFU. NOTE 1 – Provision of voice signature is by bilateral agreement. NOTE 2 – Display of additional recipients is an item for further study.	

8.6 Successful/unsuccessful message transfer notifications

A Level 1 includes information indicating the destination Voice SFU's successful and/or unsuccessful acceptance of responsibility for the message on a per recipient basis.

A Level 1 which only contains information regarding unsuccessful transfer shall be generated by either the destination Voice SFU or the transit facility as soon as it is determined that responsibility for the message on a per recipient basis cannot be accepted or transferred.

A Level 1 for successful transfer shall only be returned when requested. The request shall be processed on a per recipient basis.

An unsuccessful message transfer is indicated by the generation of a negative Level 1 (there is no requirement for the generation of a negative Level 2 in this case). It shall be essential to return a Level 1 for unsuccessful transfer on a per recipient basis.

8.7 Successful/unsuccessful message delivery notifications

A positive Level 2 may indicate successful message delivery. It shall be returned to the originating Voice SFU on a per recipient basis. A Level 2 for successful message delivery shall only be returned when requested (i.e. precedence service level indicates "certified"). The request shall be processed on a per recipient basis.

A negative Level 2 may indicate unsuccessful message delivery. It shall be returned to the originating Voice SFU on a per recipient basis. Level 2 notifications shall be generated for any unsuccessful delivery.

In the context of this service, message delivery occurs when the VMS accepts responsibility for the message.

8.8 Voice coding encoding conversion

If a Voice SFU supports voice coding encoding other than the default format defined in 7.3 (see Recommendation G.726), then the Voice SFU must support conversion between the default encoding and the other supported voice coding formats. Transfer of the message in other encoding is by bilateral agreement only.

9 Quality of service

The quality of the subject voice encoded messages received from the originating VM S&F service should not be adversely affected by any intermediary or delivering Voice SFU, transfer service, or intermediary VM S&F service through which the message may pass.

The quality of the voice message as received from the originating voice-mail system should not be adversely affected by any Voice SFU, transit facility, or any transmission service between Voice SFUs through which the voice-mail message may pass.

9.1 Objectives

The following quality of service objectives are defined for messages passed across the international boundary for delivery by a destination Voice SFU. The overall service delivery objectives are specified in Table 2. In order that the destination Voice SFU is able to meet the objectives as stated in Table 2, the originating Voice SFU should transfer the message according to the objectives illustrated in Figure 3 and described in Table 5.

The objectives for time, T_A, T_B, T_1, T_2 and T_3 should be met for at least 95% of messages (during any one-hour period) 95% of the time. The number of attempts to deliver a message to the destination terminal and the interval between attempts are a local matter.

The quality of service targets specified in Table 5 should not be affected by any transit of transmission service elements.

If a message is interrupted during the delivery from the destination Voice SFU to the destination VMS, subsequent attempts to deliver the message should transfer all of the message.

System design and dimensioning should be such that the quality of service objectives are met for at least 95% of messages received during any one-hour period 95% of the time.

9.2 Storage capacity

Storage capacity should be sufficient to provide the quality of service target values stated in Table 5.

9.3 Observations on the quality of service

Service providers shall make observations to evaluate the quality of the VM S&F service across national boundaries.

9.4 Duration of service

The national and international VM S&F service shall operate continuously.

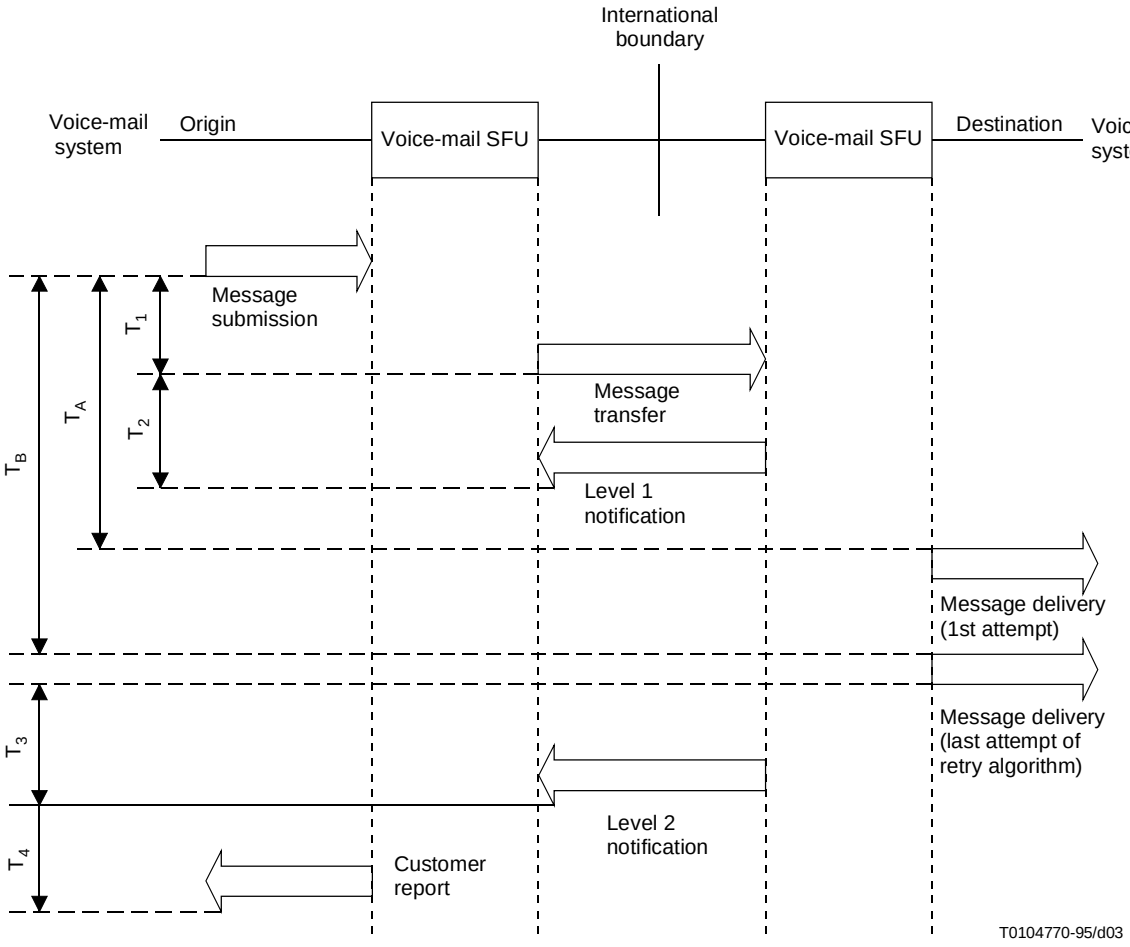

Figure 3/F.471 – Voice-mail message transfer process

Table 5/F.471 – Quality of service targets

Time	Description	CMD	Target (hours)
T_A	Time from the end of submission of the message, or the time specified for the deferred delivery, to the start of the first call attempt.	Urgent routine	≤ 0.5 ≤ 2.0
T_B	Time from the end of submission of the message, or the time specified for deferred delivery to the forced generation of a negative second level notification and termination of message delivery attempt (unless transmission has already commenced).	Urgent routine	≤ 1.0 ≤ 4.0
T_1	Time from the end of submission of the message, or the time specified for deferred delivery to the end of the transfer of the message from the originating Voice SFU to the destination Voice SFU.	Urgent routine	0.3 –1.2
T_2	Time from the end of the transfer of the message from the originating Voice SFU to the destination Voice SFU, to the end of the transfer of the first level notification from the destination Voice SFU to the originating Voice SFU.	All	0.25
T_3	Time from the end of message delivery or the forced generation of a negative second level notification, to the end of the transfer of a second level notification from the destination Voice SFU to the originating Voice SFU.	All	0.3
T_4	Time from the end of transfer of a second level notification from the destination Voice SFU to the originating Voice SFU, to the generation of a customer report.	All	Local matter
CMD Class of Message Delivery			

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